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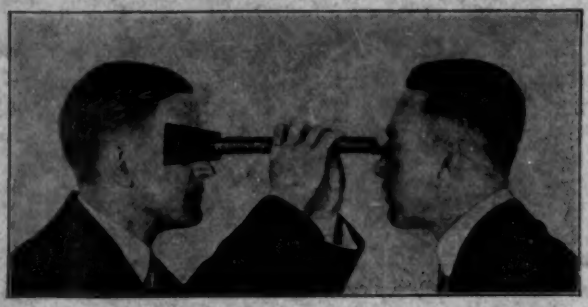

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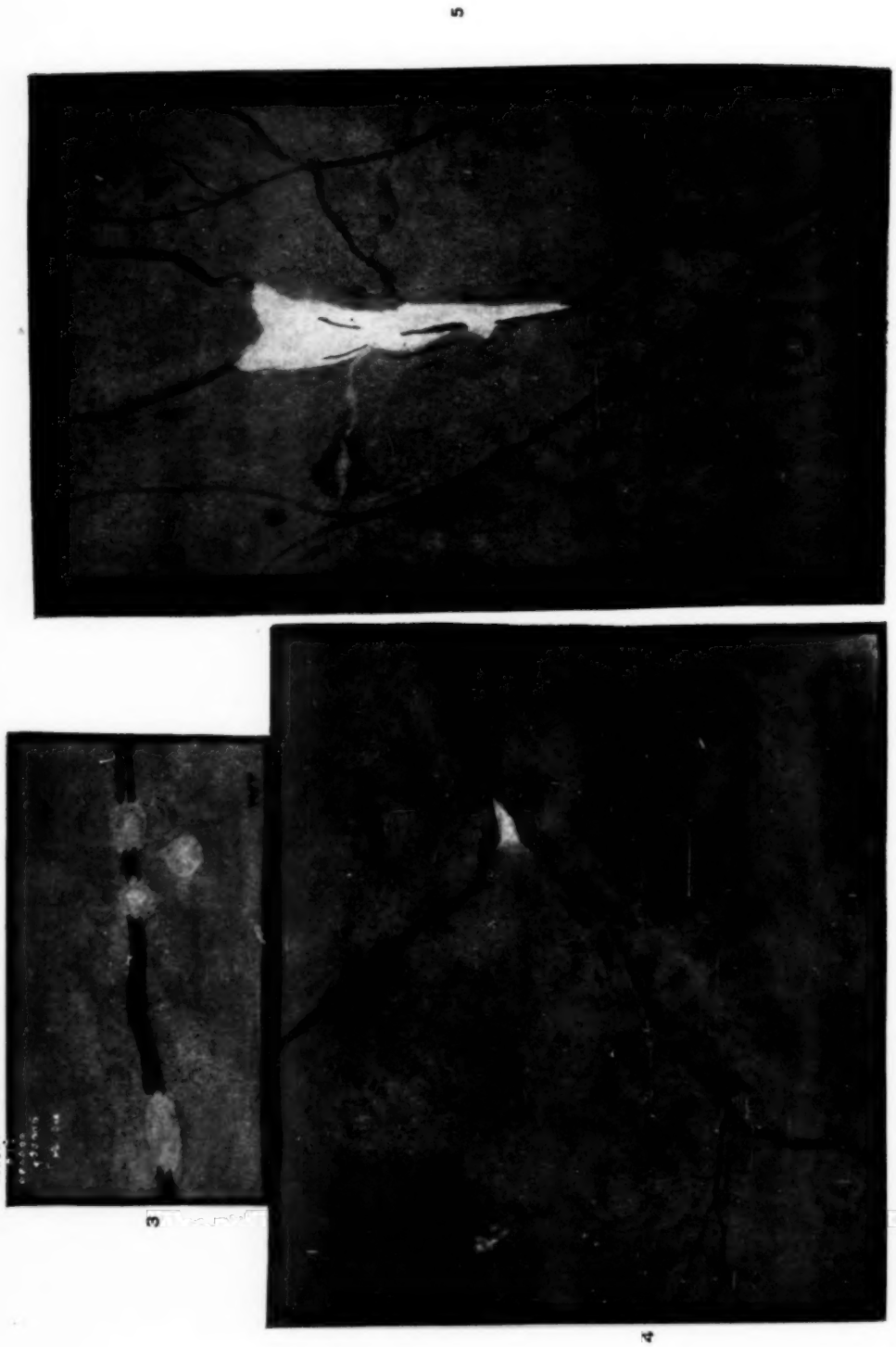

TUBERCULOSIS OF THE RETINAL VESSELS.

AMERICAN JOURNAL OF OPHTHALMOLOGY

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TUBERCULOSIS OF THE RETINA

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DENVER, COLORADO.

This paper reports three cases of retinal tuberculosis with notes on two previously reported. Read before the American Ophthalmological Society, June 16th, 1919.

Not many cases of this condition will be seen by any one observer; and only a minority are well suited to ophthalmoscopic study. The only way to fill out the ophthalmoscopic picture of this important disease is by placing on record such cases as may from time to time prove available for prolonged ophthalmoscopic observation.

It is important, too, that such records be made to include both in description and in pictorial representation, so far as possible, the minute details that tend to throw farther light on the great field of ophthalmoscopic pathology. There is reason also to present additional evidence that the group of cases here referred to really represents an important form of ocular tuberculosis; and their study may help to a better understanding of the tuberculous process in general. Such considerations seem to justify this report.

Within the last twenty years, several articles have appeared on tuberculosis of the retinal vessels. Prior to that time, the etiology of retinal vasculitis or perivasculitis was unknown. It was not until after Koch[1] had published his articles in 1884, that the causative organism of tuberculosis was known; and in 1890 he called attention[2] to the value of tuberculin as a diagnostic and therapeutic agent. With tuberculin used for diagnostic purposes it was discovered that many obscure ocular conditions were of tuberculous origin, and could be improved or cured by the intelligent administration of tuberculin.

It is to von Hippel[3] that most credit is due for the standardization of the use of tuberculin for diagnostic and therapeutic purposes in diseases of the eyes. He relied on the results obtained from subcutaneous injections of old tuberculin (O. T.); and called attention to the necessity in some instances, where negative results are obtained with the first diagnostic injection, of repeating the test and increasing the dose. He was not satisfied with a negative reaction until five or six injections had been given, with the last dose as high as 5 mg. of the O. T. If neither constitutional nor local reaction was produced with the last injection, tuberculosis was excluded as an etiologic factor. In suspected chronic tuberculosis Verhoeff[4] injects 1 mg. of tuberculin at the first dose; and if the reaction is negative, follows it with an injection of 10 mg. in 48 hours. It would be hazardous to use doses of this size in tuberculosis of the retinal vessels because of the great danger of a severe reaction being produced and followed by a massive hemorrhage into the vitreous.

The following case is of value because a study of the early lesions of tuberculosis of the retinal vessels could be made and because the case has been followed over a period of two and one-half years, during which time the disease in the right eye progressed thru the various stages even with tuberculin treatment, while the condition in the left eye was held under control and apparently cured.

Case I. L. E. B., male, age 28 years (patient of W. C. F.), rancher by occupation. Had chicken pox when a child. When 12 years old had a severe attack of influenza. Since that time has enjoyed the best of health. Denies having had veneral diseases. Has not had a chronic cough or lost weight recently. Three years ago complained of symptoms of eye strain for which glasses were prescribed, which gave relief. Family history good. Sometime in October, 1916, his eyes became very red and painful, but with no marked photophobia or lacrimation. Noticed that when rising suddenly from stooping posture, saw yellow and gray spots to the periphery of the visual fields. There was no conjunctivitis at the time. This lasted about ten days, and gradually cleared up until he was apparently well. The eye was not treated at that time. Shortly after this attack he came to the city and was employed as a bookkeeper.

November 15, 1916, the eyes became painful and red. Photophobia and lacrimation became so severe that they interfered with his work. The symptoms rapidly increased in severity until it was only with the greatest effort that he was able to keep his eyes open.

He consulted me November 17th, complaining of severe photophobia, profuse lacrimation and ocular pain. V.: R. 6/6, L. 6/6. There was marked circumcorneal injection of both eyes. The right cornea had two deeply located fine, oval, grayish infiltrated areas in the upper temporal quadrant. They were 2 mm. from the limbus. The upper opacity was 1½ mm. in diameter and was the denser. The lower was 1 mm. in diameter, and was separated from its fellow by 1 mm. of clear cornea. The left cornea had two opacities in the lower temporal quadrant, which were larger than those in the right cornea, and two small ones, pin point in size, in the pupillary area. See Fig. 1. The infiltrates were grayish in color, and did not stain. No blood vessels were present in the cornea.

Pupils were dilated with atropin and the ophthalmoscope revealed the following: Right Eye. The margin of the optic nerve was ill-defined. Two oval patches, about one-fifth disc diameter in size, of grayish exudate, one covering the superior nasal vein and the other the superior nasal artery, were seen near the margin of the nerve head. (See Fig. 2.) Two similar patches could be seen covering the first upper branch of the superior temporal vein and were about one-half disc diameter apart. The intervening portion of the vein was slightly constricted. The vein was not markedly distended distally to the in-

Fig. 1. Case I. Right eye, showing corneal lesions which brought patient under observation.

filtrations. Because of the marked photophobia the examination was discontinued. Left fundus negative.

Atropin and 5% dionin to be used locally, and calomel internally were prescribed, and a subcutaneous injection of old tuberculin was given. A thoro p h y s i c a l examination was made and at this time nothing abnormal was found.

November 20th, pupils dilated and lacrimation less. No changes in corneal opacities. Fundus examination revealed in the right eye numerous small patches of exudate covering the retinal veins. The veins were somewhat distended and near several of the exudates they were irregular. All patches were to the temporal side and in the periphery. Report from dentist negative. Wassermann negative. Urine negative. X-ray of chest, teeth, and nasal sinuses negative.

November 22nd. R. No changes in

corneal opacities. Increase in number of retinal exudates and those that were formerly present have increased slightly in size. L. No change in cornea. There is a slight haziness over inferior temporal vein which is slightly irregular. These changes are apparently a focal reaction to the tuberculin which was given November 15th. There was also a local but no constitutional reaction to tuberculin.

November 26. Corneal opacities not as dense as when last seen. Fundus much the same.

December 2, V. = R. 6/12, L. 6/15. Corneal opacities showed slight improvement. The right fundus presented two large opacities on temporal side near equator. One was about two-thirds size of disc, was yellow and covered the vessels—the other was lower and was about one and one-half times as long as disc and one-half as broad, had irregular edges and was yellow. There were two new opacities about one-fifth disc diameter in size, covering the lower temporal vein. (Figs. 2-4.) In the left eye four small patches were found in the periphery of the fundus covering veins. The veins in the vicinity of the exudates were irregular.

The patient at that time recalled having a suspected tuberculous cow in his herd from which he received his milk. Thinking that there might be a possibility that this was the bovine type of tuberculosis, 1/2,000 mg of bovine tuberculin was injected subcutaneously on Dec. 5.

December 8th, V. = R. 6/30, L. 6/30. In the right eye along the lower temporal vein, between the patches of exudate, a small hemorrhage was seen. There were several new patches of exudate in the left fundus, all far anterior. (See 3 of colored plate.) I believed these changes to be a reaction to the tuberculin which had been injected December 2.

December 10. Vision same as before. Another small hemorrhage near vein in upper part of right eye, corneal opacities were very much improved.

December 12. Fundus picture much the same.

December 16. V. = R. 6/30, L. 6/30. Corneal opacities were very much smaller and only seen with condensed light and corneal loupe. In the right eye the larger patches of exudate had disappeared and had been replaced by smaller hemorrhages. (See Plate XVI, 4 and 5.) There were other small hemorrhages in the region of the patches of exudate. There were no massive hemorrhages or vitreous haze. The left fundus showed little change from last examinations.

December 24. Two small pin point opacities were still present in the right cornea. For several days the vision had been more blurred in the morning, and cleared during the day. V. = R. 6/7.5—1. The right fundus remained about the same. V. = L. 6/10. The left cornea clear, no patches of exudate. To the nasal side of the fundus the lesions along the vessels had disappeared, but one large patch still remained on the temporal side far forward. Tuberculin 1/50,000 mg. was injected subcutaneously.

December 28. V. = R 6/12 + 3, L. 6/5. Three small opacities were still present in the right cornea. The right fundus showed marked changes. There were numerous new flame-shaped hemorrhages surrounding the veins distally to the opacities. The whole venous system was more congested and the vitreous was slightly hazy. In the left eye three small corneal opacities were again noted but the fundus showed no change since the former examination.

January 8, 1917. There were numerous flame-like hemorrhages scattered over the temporal side of the right fundus. In upper temporal region the hemorrhage had increased greatly in size, and obstructed a view of the vein. In the lower temporal area a whitish band could be seen which resembled the beginning of a retinitis proliferans. The left fundus showed changes also. The large patch of exudate that was seen at the former examination had disappeared. But on the lower temporal vein quite far forward several streaks of exudate had made their appearance. Tuberculin 1/300,000 mg. subcutaneously.

January 11. V. = R. 6/12, L. 6/6 +. Both corneas were clear, but fundus picture was about the same. No focal reaction from the tuberculin.

At this time the man who had been looking after the patient's ranch left him, and it was necessary for him to return to care for his cattle. He took his tuberculin with him, and had his local physician administer it, and said that he would consult an oculist who was located nearer to his home, from time to time. I did not see him again until April 7, 1917.

During his absence a supposedly abscessed tooth was removed, and the nasal sinuses were opened by operation with the hope of removing focal areas of infection. After the operations the vision seemed gradually to improve until April 6, when he noticed that there was a dark line in his lower temporal field, which increased in size during the day and finally included the lower nasal field also. Early in the day he noticed a small stellate black spot in the center of the visual field which was rapidly replaced by a uniform central haze. He had not been doing any unusually strenuous work just prior to these changes. We could find no external cause for it. His tuberculin had not been given regularly during his absence.

On April 7, I saw him again, with V. = R. 5/15, L. 5/5. There was a small oval infiltration in the pupillary area of the right cornea, similar to those that were present earlier in the disease.

A large subhyaloid hemorrhage was present in the upper one-fourth of the fundus. Another large hemorrhage was present in the region of the disc and two smaller ones to the nasal side of it. These were best seen with a +7 D. lens. The disc was not visible, the view of it being obscured by the hemorrhages and the hazy vitreous.

The left cornea was clear and the only change in the left fundus was a slight variation in the caliber of the lower nasal vein. 1/300,000 mg. tuberculin was given and was not followed by a reaction. The large hemorrhage seen at the last examination was almost entirely absorbed.

May 5th. V. = R. 5/20, L. 5/5 +. A few strands of connective tissue could be seen in the lower temporal side of the right fundus, which is the first sign of a retinitis proliferans, the vitreous was not so hazy and the disc outline could be faintly seen.

In the left vitreous a small mossy floater was seen, and on the extreme anterior portion of one of the branches of the upper nasal vein some patches of exudate were present. The nerve was red and its edges were hazy. 1/250,000 mg. of tuberculin was given subcutaneously.

May 7th. V. = R. 5/30, L. 5/5—2. No other change in fundus.

May 19th. Tuberculin 1/200,000 mg. subcutaneously. V. = R. 5/60, L. 5/5+. Righ eye hazy to temporal side of fundus. More strands of connective tissue below. Left fundus no pathologic changes seen.

May 21st. No changes since May 19.

Patient was again seen June 4, V. = R. 3/60, L. 5/3. There was no marked change from when last observed. 1/175,000 mg. of tuberculin given.

The patient was seen by me July 9th, 1917, a few weeks prior to my entering the military service, and at that time he showed the following: V. = R. 5/60 +, L. 5/4. The strands of connective tissue below and to the temporal field were getting whiter, but no other changes were observed.

During my absence Dr. Jackson noted the following:

September 24, 1917. V. = R. 0.08, L. 1/4. R. some fundus reflex in all directions. General haziness of vitreous. No fresh hemorrhages. Large masses of connective tissue getting white, avascular, below and to the disc.

March 8, 1918. Cleared up until two weeks ago when image seemed distorted and since has become clouded. Caused by pitching hay.

September 14, 1918. One hemorrhage the last of July, which has cleared up again. V. = R. 0.2+, L. 1.4. Right vision best eccentric, looking to right (Temporal field.).

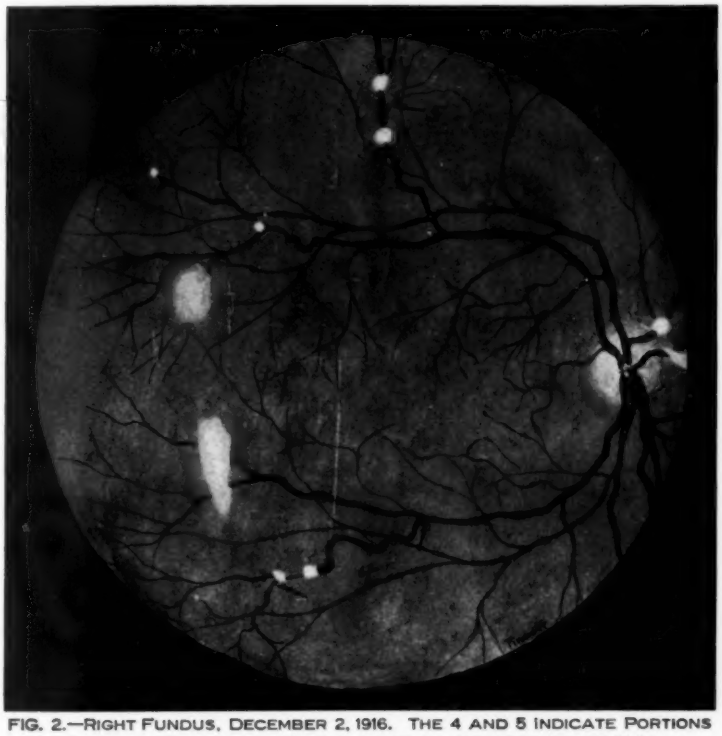

FIG. 2.—RIGHT FUNDUS, DECEMBER 2, 1916. THE 4 AND 5 INDICATE PORTIONS SHOWN IN DETAIL AT A LATER DATE ON COLORED PLATE XVI.

FIG. 6.—BANDS OF RETINITIS PROLIFERANS IN RIGHT EYE, AS SEEN TWO AND ONE-HALF YEARS AFTER ONSET OF THE DISEASE.

Ophthalmoscope. Right. Strands of white tissue and haze in lower nasal quadrant. Upper temporal almost normal to periphery. Disc or macula not seen. Some opacity far forward, chiefly on nasal side.

June 20, 1919. V. = R. 0.33, L. 1.4. The ophthalmoscope showed in the right eye the appearances of retinitis proliferans, as shown in Fig. 6.

COMMENT. In this case tuberculosis of the retinal vessels would not have been detected, until after hemorrhages were present and vision materially lowered, if it had not been for the corneal involvement which caused the photophobia and called the patient's attention to his eyes. Doubtless many of the cases of massive hemorrhage into the vitreous have the same lesions of the retinal vessels, but attention is not attracted to the eyes until the vision is disturbed.

With the history of the patient's drinking milk that was obtained from a tuberculous cow, and with the marked focal reaction after the administration of bovine tuberculin, it seems probable that the condition was the result of an infection with bovine tubercle bacilli.

The retinal involvement began as a perivasculitis and with only one exception (Fig. 2) the areas of infiltration were confined to the perivascular spaces of the veins; but, as the disease progressed in the right eye, the walls of the vessels became involved and a true phlebitis occurred. (Plate XVI, Fig. 4).

The necessity of using very small doses of tuberculin both for diagnostic and therapeutic purposes is illustrated in this case, for with as small a therapeutic dose as 1/50,000 mg. a marked focal reaction apparently took place, and caused the changes which were seen in the right eye, Dec. 28, 1916. The following dose was decreased to 1/300,000 mg. and the subsequent doses were very cautiously increased with no farther serious reactions. Tuberculin apparently had a beneficial action on the left eye in this case, for it was started when the retinal lesions had first manifested themselves in that eye and they disappeared shortly after their appearance. It is also possible that it had a detrimental influence on the right eye.

CASE II. R. B. T. Clergyman (patient of E. J.), aged 33, when he came in 1906, for a change of the glasses he had been wearing for six years. For four years he had noticed distant vision growing indistinct, and his lenses were found insufficient to correct his M. As. He required R.—2.50 ⊂ +1.50 cyl. Ax. 67° V. = 1.1. L.—2.50 ⊂ + 1.75 cyl. Ax. 95° V.= 1.1. Both 1.2.

1911. 9.27. His vision had again grown indistinct from a slight increase of the myopic astigmatism, and change in its meridians. His new correcting lenses again gave V.= 1.2.

1916. 1.25. He had lost much sleep lately, and noticed muscae, and lids felt "granulated." There was some venous hyperemia and papillary roughening of the palpebral conjunctiva. V.= 1.1 in each eye. Ointment of yellow oxide of mercury 1:180, and rest from reading, gave relief.

1916. 12.5. He had lately noticed muscae before left eye and required a slight change of the left lens, which again gave relief. L.—3 ⊂ +2 cyl. Ax. 100° = 1.1. His accommodation was 5 D.

He had come to Colorado in 1900, had suffered from obscure pulmonary symptoms, poor general health and tuberculosis of the testes, which latter were removed three years later.

1917. 2.19. A spot before the left eye has been growing worse. His corrected vision is only 0.5. Ophthalmoscope, L. Pupil dilated with homatropin. Media clear. The macula shows 20 or more rather faint grayish white spots, arranged in lines radiating from the fovea. The retinal veins are all somewhat dilated and tortuous; but esespecially the upper temporal and its branches. In the upper temporal retina are many small flame-shaped hemorrhages. These begin two disc diameters from the disc, and extend up and forward to the periphery of the visible fundus. He was referred to Dr. C. N. Meader, who found slight roughening of the respiratory sounds and dullness at the apices, which he took to be evi-

dence of an old lesion; but no other evidence of active tuberculosis.

2.19. He received 1/10 mg. of old tuberculin. This caused a distinct general reaction including disturbance of blood pressure and nausea, which was taken to indicate an adrenal lesion. But there was no objective evidence of a focal reaction in the eye. Vision was unchanged, except that he complained that a distortion of objects seen with L. seemed slightly increased.

3.5. Began use of 1/100,000 mg. bacillus emulsion once a week gradually increasing the dose.

3.16. About 22 hours after an increased dose of tuberculin, the optic discs looked slightly redder, and he noticed more distortion of objects with this eye than before the dose was given.

4.3. After receiving tuberculin yesterday, he noticed more distortion. "Things looked drunk and compressed laterally." V.= 0.5.

4.12. V. =0.7. The white spots in the macula are much more distinct than they were two months ago. There are remains of several hemorrhages in the upper retina, the region directly above the disc being more involved than at first. Some of the veins are obscured at the crossings.

5.3. V.= 0.6, but was worse after the last dose of tuberculin, 9 days ago.

7.2. V. = 0.8. He thinks it was better two weeks ago. Since then he got over-tired, driving his car on a trip of about 500 miles thru the mountains.

7.23. V. = 0.7. Could not rest so much as he wished lately. Vision "confused" since he had two tuberculin injections with only a week interval. After this two weeks' intervals were allowed.

At this time the white spots in and about the macula were most numerous 50 or 60 and very sharp and distinct. Small hemorrhages still occurred, but they were getting less numerous. The upper temporal retina was hazy. But other portions remained normal. After this all the appearances of retinal disease gradually diminished.

1918. 12.3. 1/10 mg. gave pain in elbow for last 2 months.

1918. 1.28. There are still about 15 small white spots in the upper nasal quadrant of the macula, none of them as large as the largest retinal artery in diameter. The upper veins are still large and tortuous. The haziness of the retina has almost or quite cleared up. There are no hemorrhages.

10.23. The retina above the disc was hazy and swollen and two small indefinite flame-shaped hemorrhages were found. The veins of this region were rather large and slightly tortuous. The macula appeared quite normal. V. = 1.?

11.22. The retina above the disc has cleared up. The vessels all appear normal. R. — 2.25 ⌒ + 1.25 Cyl. ax. 80° = 1.1. L. —3. ⌒ + 2.50 Cyl. ax. 103° = 1.

The left eye has continued normal. The right eye has not been affected at any time. At no time was the patient's general health much impaired. Apart from the tuberculin reaction there was no fever, and while under treatment he gained 11 pounds in weight. He continued the whole time walking and riding thru the mountains, leading an active rather strenuous outdoor life, in the care of his large mountain parish between 6,000 and 8,000 feet above the sea level.

CASE III. Male aged 25, while studying hard for the Priesthood two years before and in poor health, lost the sight of his left eye from vitreous hemorrhage. In February, 2 months later, his eye was well again. In March the right eye became blind from the same cause, but it had recovered in August. In September the hemorrhages started again. He saw Dr. Arnold Knapp of New York City, and in June last he had been put upon the use of tuberculin, and his sight in both eyes had cleared so that he could read again. Then the right rapidly grew worse, and he was sent from Eastern New York to Colorado.

1917. 12.19. Vision R. moving fingers at one foot in the extreme temporal field. L. = + 0.25 Cyl. ax. 170° = 1.1.

Ophthalmoscope. R. under atropin, cornea and lens clear, vitreous clouded, no fundus details visible. There is a grayish red reflex in all directions and floating masses, which in the lower temporal vitreous look almost like detached

retina, but no vessels are found. Left eye slight haziness of vitreous. Choroid rather patchy and "moth eaten," but optic disc and retinal vessels normal.

Locally hot stupes and atropin were employed for the right eye, and he was referred to Dr. C. N. Meader, who found infiltration of apices of the lungs, especially the right; and put him on general treatment and regimen for tuberculosis. But without tuberculin treatment.

1918. 1.18. The right eye shows a yellowish gray reflex without details over the whole fundus, except the anterior nasal portion which is dark. He has gained 3 pounds in weight.

2.1. The anterior nasal portion is clearing. V. R. = 1/500.

2.15. A fresh hemorrhage occurred in the lower portion of the vitreous, noticed as a black mass in the upper field of vision and increased haziness.

4.5. There was another fresh hemorrhage seen as a black mass in the lower vitreous.

5.3. There were some whitish masses in the vitreous up and out, and fainter red reflex in other directions. No vessels visible on the masses. His general condition is better, and he can walk five miles without feeling the worse for it.

June 6, R. V. = 0.002. A whitish mass in vitreous, seen with a 12.D. lens, shows fine vessels; and masses of vitreous opacity are seen toward the periphery of the fundus.

8.15. R. V. = 0.004. Ophthalmoscopic findings about as before.

1919. 1.29. R. There is a dense general haze of the vitreous, permitting a moderate reflex. But no fresh hemorrhages since last noted. V. = 0.05.

Left, V. = 1.2. Fundus normal but one distinct linear opacity in vitreous to nasal side of center.

Earlier Cases. Regarding the cases previously reported it is of interest to note that the patient whose fundus condition was illustrated in plate facing p. 579, vol. 14, of the Transactions of this Society[5] has remained in good health, with practically no change in the retinal condition since that time, corrected vision 0.8 when last examined.

Mrs. W. R. L., whose case was alluded to in the same paper (detailed report elsewhere[6]), after months of recurring hemorrhages had recovered, V. R. = 0.06, L. 0.4. She seemed in good health for 3 months after the birth of her child, but gradually lost weight, and felt less well.

1916. 3.6. Her vision was R. 0.06, L. 0.4. Six weeks later she noticed some disturbance of vision.

4.28. V. R. = 0.06 L. 0.15. The ophthalmoscope showed decidedly increased clouding of the vitreous, but no fresh hemorrhage.

5.1. A fresh hemorrhage occurred the evening of April 29th, in the left eye. Vision is reduced to perception of hand movements. The hemorrhage is located in the temporal part of the vitreous. To the nasal side the fundus reflex is good and there are whitish masses well forward: (25 to 35 D. H.)

5.15. L. Has gradually improved, vitreous clearing. V. = 0.07.

5.22. Two days ago a fresh hemorrhage occurred in the right eye, which shows general haze of the vitreous and V. = moving shadows.

5.29. V. = L. 0.2. It was worse again six days ago, so that she had to be led around.

6.20. Sight was better until 8 days ago, then worse, since then clearing. Now V. R. 0.002, L. 0.1.

7.27. Feels the heat, appetite depressed. Sight beginning to improve after fresh hemorrhage 3 days ago.

8.25. V. R. = 0.012, L. 0.05.

9.25. Fresh clouding 3 weeks ago. Improving since. V. R. = 0.012, L. = .005.

10.13. She was sent from the city to her old home on a farm in South Dakota.

1917. 2.13. She has lived out of doors, gained weight and strength. V. R. = 0.06, L. 0.35.

3.8. V. has dropped to 0.1 in L., the better eye, with fresh clouding.

3.31. V. = R. 0.12, L. 0.003.

5.23. Sight has steadily improved. R. = 0.12, L. 0.25.

11.27. There was a new hemorrhage in July and after that steady improvement. V. = R. 0.14, L. 0.4.

1918. 1.8. Had some disturbance of vision 3 weeks ago, but no evidence of fresh hemorrhage. V. = R. 0.01, L. 0.04.

1.18. Sight seems worse. V. = R. 0.01, L. 0.4. She was again put on tuberculin which had been discontinued for 15 months.

2.16. There has been aching about her right ear, and a fresh hemorrhage into the vitreous in the left. V. R. = 0.012, L. moving objects.

3.11. She again returned to South Dakota.

For about two years the discs and most of the fundus have been invisible. When the vitreous was most clear, masses of white retinitis proliferans could be seen thru it.

CONCLUSIONS: From the cases now reported it appears that:

Retinal tuberculosis begins by the appearance of white infiltrates in front of certain retinal vessels, most frequently the veins. Later these particular vessels show all the signs of perivasculitis and the affected portions of the veins may be greatly altered in caliber. At this stage hemorrhages occur and the patient is likely to first come under observation for impairment of vision.

The hemorrhages may be comparatively small and confined to the retina throughout the course of the disease; clearing up in the end, so as to leave no trace visible with the ophthalmoscope, and good restoration of vision. In other cases the hemorrhages are massive, pushing off the vitreous or bursting into it, and followed by the well known picture of retinitis proliferans and great permanent impairment of vision.

In many cases in which the eye-ground remains visible thruout, white dots resembling those seen in renal retinitis are formed in the macula; causing impairment of vision, but less than their appearance would lead us to expect, and subsequently clearing up entirely.

Often both eyes are affected in the beginning, but one may remain only slightly involved, and recover completely, while the other is greatly and permanently damaged by hemorrhage.

The course of retinal tuberculosis is more protracted than that of other diseases likely to cause some of the same ophthalmoscopic symptoms.

Cases not attended with pyrexia, or extensive tuberculous lesions in other parts of the body, do well on small doses of tuberculin given at intervals of at least one week; and all cases require the general regimen and treatment for combating tuberculosis.

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THE TREATMENT OF DACRYOCYSTITIS BY CURETTAGE. (THOMPSON): SUPPLEMENTED BY IMMEDIATE RAPID DILATATION OF THE LACRIMONASAL DUCT

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This paper discusses the reasons for using this method of treatment, describes it, reports a series of cases treated by it, and proposes certain instruments for use in such operations. Read before the Section on Ophthalmology, American Medical Association, June, 1919.

In dealing surgically with any diseased organ the method of choice should be that which respects, as far as possible, the anatomic integrity of the organ and its physiologic function. It is, of course, not always possible to attain this ideal. Conservative, or what, in this connection, might be better termed "preservative" surgery, may err in attempting to save an organ which can never function normally, and which may, if retained, be a source of continued trouble.

Interference with the free drainage of any of the mucous membrane lined cavities having an outlet is inevitably followed by infection and inflammation,—e. g., cystitis consecutive to enlarged prostate, and dacryocystitis following occlusion of the nasal duct. In cases of this character the surgical method of choice should, if possible, be that which respects the integrity of the organ and seeks to reestablish permanent drainage thru the outlet designed by nature for that purpose.

The assumption that, as a prerequisite to the treatment of dacryocystitis, it was necessary to secure adequate and permanent drainage led to the use of inflexible probes shaped to conform to the course and supposed caliber of the nasal duct. One of the earliest to advocate and practice this method was Bowman, who also suggested an incision of the canaliculus for the purpose of permitting the entrance of larger probes.

It cannot be gainsaid that occasionally this method led to the reestablishment of patency, with resultant diminution or abolition of the discharge from the sac. But the failures far outnumbered the successes; the treatment was painful, the probing had to be kept up for months or years and even then there was no assurance that the opening so laboriously secured would remain open permanently. One reason for failure lay in the inadequate size of Bowman's probes—his largest (No. 6) being only 1.5 mm. in diameter, whereas, as has been shown by Theobald[1] the average diameter of the lacrimonasal canal is something over 4 mm. Many who practiced Bowman's method in their early professional career eventually became convinced of its futility and abandoned probes altogether, contenting themselves with frequent syringing of the sac thru the slit canaliculus. Others pinned their faith to styles worn permanently. Still others resorted to the the use of large probes (Theobald and Ziegler) or adopted excision or destruction of the sac.

With improvement in the technic of sac removal or sac destruction, the most annoying and potentially dangerous feature of this disease—accumulation of pus in the sac—was immediately done away with. Equally striking would be the improvement or cure of the attendant lacrimal conjunctivitis, so that life again became bearable to the individual who had, possibly for years, carried about a purulent, watery eye. This operation, improvement as it was over older methods and very widely adopted, had two serious drawbacks,—it necessarily destroyed the drainage apparatus and left the eye more or less watery. The amount of moisture in the eye after operation varied from practically no increase in the surface film normal to the eye with drainage apparatus intact, to a suffusion of the eye with tears which constantly over-

flowed and produced a moist eczema of the skin quite as annoying to the patient as the former purulent accumulation in the sac. In an effort to lessen this annoying epiphora the palpebral portion of the lacrimal gland was sometimes removed. The continuance of pus formation after operation was not altogether rare and indicated failure to remove or destroy all the mucosa of the sac.

It is difficult to determine just what percentage of extirpations of the sac are successful. The majority of these cases occur in dispensary patients who are notoriously apt to pass from observation before the interested surgeon has a chance to determine the final result of his operation. As far as dispensary patients are concerned, it is probable that the report made to Mosher by his ophthalmic house officers[2] that "a third of the results were satisfactory" is not far wide of the mark. If this figure approximates the percentage of successful results, it is not surprising that many sac extirpators have sought other methods which might conceivably produce a higher percentage of successes. I suspect, too, that many who are willing to resort to extirpation of the sac as a last resort, rebel against a method which destroys an organ and hence its physiologic function, and will seek first to secure some form of permanent drainage of the suppurating sac, whether that be thru the natural opening or by an opening artificially made directly from the nose to the sac. The endonasal operation on the lacrimal sac has in recent years engaged the attention of rhinologists, and a variety of more or less closely related procedures have been proposed. This subject was thoroly discussed before this section in 1917 by Chamberlain.[3]

As the aim of any intranasal operation is to create a permanent pathway for the tears and secretions from the sac, and if that permanent pathway is not secured the operation must be accounted a failure, it is interesting to note the opinions of some of the expert rhinologists who have devoted special attention to this operation. Chamberlain says: "Whether or not the physiologic pathway for the tears into the nose can be maintained permanently, in a sufficient percentage of cases at the hands of the average rhinologist, is a question which time alone can answer." Mosher, in discussion, remarked that "all intranasal methods must face the danger of reclosure of the canal," and that "every form of intranasal operation on the lacrimal sac and the nasal duct is only a temporary success unless supplemented with frequent probing or the prolonged wearing of a style."

In view of the foregoing, it can hardly be affirmed that an impeccable surgical method for dacryocystitis has yet been evolved. It behooves us all, therefore, to take cognizance of, and put into practice, any new proposal which conceivably can aid in overcoming this intractable disease. Such a proposal was recently put forward by W. R. Thompson.[4] Before describing his method of treatment, Thompson presents some reasons in contravention of the generally accepted belief that disease of the lacrimal duct is of nasal origin and in support of his theory that solid foreign material carried by the tears thru the punctum and sac finally lodges on a fold of mucous membrane in the bony duct there to form the nucleus of an obstruction, which shall eventually block the canal. Thompson says:

"It is the function of the lacrimal canals, sac and nasal duct to convey not only liquids to the nasal cavity from the conjunctival sac, but also such solid matter as passes thru the canaliculi. The nasal duct is lined with mucous membrane continuous with the conjunctiva, which contains numerous folds resembling valves. It not only seems possible, but it is very probable, that some of these foreign bodies may lodge and become fixed in these folds . . . It requires only a short time for a fixed foreign body to create irritation and erosion of the surrounding structures as in the case of a foreign body in the nares. When sufficient time has elapsed these foreign

bodies increase in size by the deposition of salts from the tears and serum.

"The clinical history of stricture of the nasal duct from its earliest manifestations (the stage of epiphora) to the time of complete closure with extensive pus formation or mucocele, is exactly what would be expected as the result of the presence of a foreign body in the duct with its irresistible tendencies to inflammation, ulceration and accretion."

It is a well known fact that obstructions of the canaliculi may occur thru the entrance of foreign bodies from the conjunctival sac. It would indeed be surprising if, occasionally, these minute bodies which in one manner or another find their way into the eyes, should not, if they fail to find a fixed position on the cornea, bulbar or palpebral conjunctiva, be swept into the puncta, especially the lower one. Cilia, broken off or shed, not rarely find their way into the punctum and cause much irritation until extracted. I have on two occasions removed short hairs (not over 2 mm. long) from the puncta. The signs of irritation began shortly after a haircut so that it is reasonable to suppose that the extracted hair was a fragment of the scalp hair and not a cilium. A foreign body carried deeper into the canaliculus would in all probability form the nucleus of a dacryolith by the deposition of lime salts. It is well known, too, as noted by Weeks[5], that occasionally fungoid masses due to the presence of penicillium, leptothrix, streptothrix or actinomyces, may remain in the canaliculus for years, causing slight disturbance and a small amount of mucopurulent secretion. Theobald notes that bits of the beards of wheat and barley have been found lodged in the canaliculi. Polypi, too, have been met with in the lacrimal sac and by obstructing the passage of tears into the nose, gave rise to symptoms resembling those of stenosis of the duct.

The lacrimal drainage apparatus is a continuous mucous-membrane-lined canal of varying caliber extending from the puncta to the nasal orifice of the bony duct. Once a foreign body has lodged in the canaliculus, it may, of course, remain there and form the nucleus of a dacryolith. On the other hand, there are no natural barriers to its passage into the sac and down into the duct. In the duct its progress might very well be interrupted by one of the folds or rugae into which the mucous membrane of the duct is thrown. Assuming that such lodgment occurs, what is to prevent the foreign body forming at this site the nucleus of a lime salt deposit? Whether or not such a mass grows sufficiently large actually to occlude the lumen, the simple fact that it remains in prolonged contact with the mucous membrane would lead to inflammation, ulceration and eventually to the formation of granulation tissue. That such granulation tissue does occur in the bony duct is affirmed by Ziegler.[6]

Even if we reject Dr. Thompson's very plausible theory, we must assume that the mucous membrane lining the sac and the duct is chronically inflamed. It may even be, as stated by Fergus,[7] that the essence of dacryocystitis is a septic mucous membrane and not a stricture. Surgical methods hitherto have not been directed against the diseased mucosa, a fact which may account for many failures in treatment.

If, then, we are dealing with a mucous membrane which presents polypi, areas of ulceration, and granulation tissue, it is essential that such products of inflammation should be gotten rid of preparatory to topical treatment of the mucous membrane. And this is precisely the rationale of Dr. Thompson's method. The steps of his operation are as follows:

The canaliculus is freely slit in order to permit the entrance of a large size Buck's flexible ear curette. In the presence of pus in the sac the walls are gently curetted. In the absence of sac infection, the small size curette is entered in the duct the same as a probe. When the obstruction is reached gentle pressure is made in connection with an augur-like motion until the curette finds its way into the nasal cavity. The instrument should be manipulated until it passes easily thru the stricture and the entire duct. The next larger

size is to be used in the same manner and so on until a curette practically the size of the duct will pass easily into the nose and all sensation of roughness at the site of the stricture has been removed. The operation is completed by applying tr. iodin lightly to the walls of the sac and duct.

A general anesthetic has been found necessary for children and some nervous adults. For others a preliminary hypodermic injection of morphin, 0.5 per cent cocain in the conjunctival and lacrimal sacs, and a subcutaneous injection of one-half per cent cocain in the vicinity of the sac has given sufficient anesthesia.

Although curettage of the sac and duct as an auxiliary method of treating dacryocystitis is not altogether new, Dr. Thompson should be credited with applying it as the principal feature of an operative measure. Landolt and Gygax[8] advocate curettage of the sac and duct "with a small curved sharp fenestrated spoon" when syringing and probing fail to relieve or when "the patient has but a few days to spare for treatment." Ziegler[9], whose advocacy of rapid dilatation of the nasal duct is so well known, pictures a lacrimal curette the use of which he thus describes: "If proliferation occurs in the lumen of the duct I employ a lacrimal curette to remove the granulomata. . . . . The procedure is simple and the result will often prove most gratifying." It is very evident that Ziegler did not consider curettage an essential feature of his operation, but useful only as an adjuvant in exceptional cases.

As will be noted from the case reports a number of my patients operated on according to the technic of Dr. Thompson, presented themselves weeks or months later with recurrences. Unquestionably curettage causes a good deal of primary postoperative reaction with serous exudate and swelling of the mucosa, which may be sufficient to block the canal. Undrained fluid accumulating in the sac forms an excellent culture medium for the propagation of whatever organisms remain, and hence pus in expressible quantities may occur. Reasoning thus, it seemed to me that if curettage were supplemented by immediate rapid dilatation of the bony duct, there would be less likelihood of temporary occlusion; and thus drainage would at all times be sufficiently free to prevent accumulation in the sac. In this connection it is interesting to note that rapid dilatation to insure adequate drainage has recently been practiced by Verhoeff[10] with gratifying results in connection with his revival of Agnew's operation in acute phlegmon of the sac.

My present procedure is as follows: After slightly dilating the punctum with a conical probe the sac is irrigated with $HgCl_2$ 1/5000 and a few drops of cocain 5% with epinephrin injected. The lower canaliculus is then freely slit. The medium sized curette is passed to the sac and the surface gently curetted. A moderate sized probe, Theobald 5 or 6, is then introduced and passed to the nostril. The purpose of this preliminary probing is twofold, (1) to insure that the curette shall find its way into the lumen of the duct and avoid the possibility of a false passage. (Dr. Thompson, in a personal communication, states that, in his opinion, there is no necessity for this precaution); and (2) to create an opening sufficient to permit an anesthetic solution to come in contact with the mucous membrane. On withdrawing the probe I inject a few drops of a 10 per cent solution of cocain (with epinephrin) and repeat twice at two-minute intervals. During the injection the patient is instructed to bend his head forward so that the strong cocain solution shall emerge from the nostril. By this method I have obtained adequate anesthesia for the subsequent steps and have not found it necessary to give a hypodermic of morphin or to inject cocain subcutaneously in the region of the sac. The curettage is then carried out according to the technic described by Thompson.

The diameter of the curetting ring of Buck's largest curette is 3 mm., so that it is obvious that a slightly smaller probe can now be readily passed to the nostril. Beginning with a probe of this size (T.11), I introduce one after another,

12, 13 and 14, and in several cases T. 15 and 16. It goes without saying that very firm pressure must be exerted in introducing these large probes and one sometimes hears a crackling sound which, no doubt, indicates slight fracture of the bony walls of the duct. This has been noted by both Theobald and Ziegler as a necessary concomitant in passing large probes, and they agree—and I concur in the opinion—that "nothing more serious than ecchymosis has followed." An applicator formed by wrapping absorbent cotton tightly around the ring of the smallest sized curette is used to apply Tr. iodin lightly to the walls of the sac and duct.

As a rule, the postoperative reaction is exceedingly slight. There is dull aching pain. lasting several hours, but never, in my experience, so severe as to require a narcotic. Occasionally there is considerable edema of the lids and cheek adjacent. Iced applications, a boric acid wash and a bland ointment suffice for the immediate after treatment. For about a week following the operation the region of the sac remains sensitive to pressure.

The immediate and gratifying effect of the operation—and this has been true of every case—is the prompt cessation of pus formation in the sac. To be strictly within the bounds of truth, one should say, rather, that no pus can be pressed out of the sac into the conjunctival sac. If there be any secretion, whether of a purulent, mucoid or serous nature, it is evidently efficiently drained thru the dilated bony duct. If I am able to keep the patient under observation, I am in the habit of passing a moderate sized probe, say Theobald 10, about once in three weeks for the double purpose of keeping the slit canaliculus stretched and of ensuring an adequate lumen to the bony duct.

A probe of this size passes readily and after cocainization, almost painlessly. Many of these cases give evidence at the operation of denuded bone. Subsequent probings give the impression of the probe being in contact with normal mucous membrane.

Since May 26, 1918, I have performed curettage, or curettage with rapid dilatation, on all patients with dacryocystitis, in dispensary or private practice. The following is a summary of these cases.

CASE REPORTS

1. Miss L. H., age 38. L. dacryocystitis. Both canaliculi had been freely slit and small probes used by another surgeon. Much mucus expressible. May 26, Thompson curettage with dilatation to T. 13. Seen September 7. Mucus no longer formed and the passage to the nostril was free, but there remained annoying stillicidium. Patient refused further treatment.

2. Mrs. E. B., age 71. Seen first March 11, 1918, with a severe hypopyon ulcer (pneumococcal) which promptly yielded to thermophore treatment. Found to have bilateral dacryocystitis. May 31, 1918, preliminary dilatation to T. 11 then curettage, with application of Tr. iodin (left). Perfect result February 21, 1919 (9 months after operation).

3. Mrs. F. E., age 67. R. dacryocystitis of several years duration. Has been treated for one year in clinic with probes, and syringing, without improvement. Typical Thompson performed June 1st. Seen last September 14th. Perfect result (no pus, no stillicidium, fluid passes freely to nostril).

4. Mrs. C. H., age 45. Thompson curettage June 6th. Immediate cessation of pus. During my absence from the city the patient returned to the clinic (August 17th) with recurrence. Nothing was done and she has not been seen since.

5. R. sac of Mrs. E. B. (Case 2). Thompson curettage June 6, 1918. Recurrence of pus June 17th. Repetition of curettage with dilatation to T. 8. Mucus can still be pressed out February 21, 1919.

6. Miss F. H., age 16. Seen first June 7, 1918. R. dacryocystitis of seven years' duration. No treatment. Thompson's curettage without dilatation. Immediate improvement. In September, small amount of mucus could be pressed out of sac. Rapid dilatation up to T. 10 with application to the sac and duct of Tr. iodin. Seen March 8, 1919, perfect result. (No pus, no stillicidium, injected fluid passes freely to nostril.)

7. Mrs. M. W., age 77. L. dacryocystitis of five years' duration. Thompson's operation without dilatation performed June 25, 1918. December 30th pus formation. Repeated Thompson and rapidly dilated up to T. 15, encountering some denuded bone. Tr. iodin applied. January 30, 1919, no pus. T. 10 passes freely. Duct smooth thruout.

8. Mrs. M. B., age 60. R. eye has watered for years, R. pus expressible. June 25, 1918, Thompson's operation. November 9th, slight recurrence of pus formation. Repeated Thompson with rapid dilatation up to T. 13. Tr. iodin applied. December 20th, no pus, eye in fine condition. Passed T. 15 to nostril easily. Last seen January 28th. T. 12 passes easily. Duct lining smooth thruout.

13. F. L., male, age 72. Has lid scars of old trachoma with partial entropion of left lower lid. R. dacryocystitis. Curettage of sac and duct. Rapid dilata-

Fig. 1. Lacrimal sac bur (Green).

Last seen January 2, 1919. Passed T. 7 easily. No pus. A little overflow of tears when patient goes out into the wind.

9. B. B., male, age 63. Bilateral dacryocystitis of many years' duration. Lost vision of left eye from serpent ulcer. Thompson's operation on L. sac September 11, 1918, without dilatation. Seen March 10, 1919. No pus. Fluid passes freely to nostril.

10. R. sac of B. B. (Case 9.) Operated September 13, 1918, by Thompson's method, without dilatation. Seen March 10, 1919. Perfect result. Fluid passes to nostril.

tion up to T. 10 (October 14, 1918). Seen December 15, 1918. No pus expressible. Passed T. 8 easily.

14. M. H., female, age 10. L. dilated sac with purulent contents. Under general anesthesia, Thompson's curettage, rapid dilatation up to T. 10. October 23, 1918. Last seen November 30th. No pus. Fluid passes to nostril. Did not attempt to probe. (Letter from grandmother states that pus has recurred. March 10, 1919).

15. D. L., male, age 13. A half-witted child. Bilateral dacryocystitis beginning at age of 4. Right sac had been

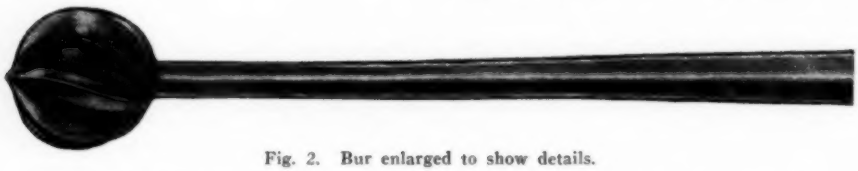

Fig. 2. Bur enlarged to show details.

11. Mrs. H. F. G., age 67. L. dacryocystitis two months' duration. September 27, 1918, Thompson's curettage. Denuded bone felt in the upper third of the nasal duct. Sac remained free from pus to November 5th, on which date a small amount could be expressed. Repeated curettage, dilated to T. 12 and applied Tr. iodin. Seen March 4th. Sac free from pus; passed T. 8 readily.

12. Mrs. J. F., age 59. R. dacryocystitis of many years' duration. Pus expressible. October 4, 1918, Thompson's operation thru upper canaliculus, using only smaller and middle sized curette. Small probe encountered denuded bone lower half of bony duct. extirpated by another surgeon. Left duct had been probed, with no improvement. Greatly dilated left sac containing large quantity of pus. November 14th, Thompson's curettage with rapid dilatation up to T. 14. Denuded bone felt. November 25th, pus not expressible. Permitted to return to home in country. Four weeks later recurrence of pus. Father, given the choice of repetition of curettage and destruction of the sac by Gifford's method, chose the latter. January 7th. Seen March 10, 1919. Good result, but considerable overflow of tears.

16. Mrs. E. H., aged 64. Seen November 21, 1918. History, left eye watering many years. Pus expressible.

Thompson's operation without dilatation. December 14th, slight recurrence of pus. Used dichloramine-T ½%. December 26th, pus continues. Theobald 8 passed, encountering denuded bone. Repeated Thompson, rapidly dilated up to T. 16 and applied Tr. iodin. January 2, 1919, no pus. T. 10 passed easily to nostril. February 7th, no pus. T. 10 easily passed duct smooth thruout.

Of these sixteen cases, ten yielded first class results(no discharge, free drainage and moderate stillicidium or none). Three were improved (no pus but a small amount of mucus expressible), and three were failures. It is interesting to note that of the latter two were children.

The operation is not proposed for tuberculosis or syphilitic disease of the tear sac. In these cases, nothing less than complete extirpation with appropriate general treatment will suffice. I have had no opportunity of trying curettage in trachoma of the sac. The efficacy of various abrasive methods in palpebral trachoma would lead one to infer that a method similar in principle should be useful in ridding the sac of trachomatous granulations. Objection has been raised to curettage on the assumption that it destroys the mucosa and hence must lead sooner or later to cicatricial atresia of the duct, and the comparison has been made between curettage of the nasal end of the Eustachian tube and the procedure under discussion. But the analogy is not perfect: in the former case the curettage is deep and vigorous in order to destroy the mucosa and insure cicatricial stenosis of the nasal end of the tube: in the latter, the curettage is superficial and as gentle as possible. All evidence points to a regeneration rather than a destruction of mucosa.

The only drawbacks that I have observed are (1) a tendency of the canaliculus to become narrow at its junction with the sac—readily overcome by dilatation—and (2) a moderate stillicidium in cold and wind. This was present in about one-third of my cases and should be ascribed to the interference with capillarity due to the slit canaliculus and not to the curettage.

Fig. 3. Lacrimal sac reamer (Green).

CONCLUSIONS: The combined operation of curettage followed by immediate rapid dilatation possesses many advantages.

1. It removes any foreign material that may have lodged in the canaliculi, lacrimal sac and bony duct.
2. If polypi or granulation tissue are present in any part of the lacrimonasal duct, they are effectually removed.
3. Thus prepared, the duct readily admits large probes (T. 11 or 12) and can be dilated up to T. 13, 14, 15 or 16 at the first sitting, thus insuring adequate primary and secondary drainage.

Fig. 4. Reamer enlarged to show details.

4. The application of Tr. iodin to the mucous surface sterilizes it and stimulates it to normal activity and regeneration.
5. If pus should reform, the operation can be readily repeated.
6. It is an "office" or "outpatient" operation and is often successful even when the patient cannot return for subsequent observation and probing.
7. Should this method fail, the sac can be extirpated or destroyed as readily as if no operation had been performed.
8. In my opinion, this operation will give relief in many cases of dacryocysti-

tis which have hitherto been condemned to extirpation of the sac. As it offers the chance of efficient drainage thru the natural passage, it should be preferred to any endonasal operation.

Since this paper was written, I have had V. Mueller & Co., Chicago, make, according to original designs, a set of lacrimal burs and reamers. The purpose of these instruments is to remove any foreign material or inflammatory products from the sac and duct, with a minimum of damage to the diseased mucosa. The set consists of four instruments:

1. Lacrimal sac bur. Fig. 1, and Fig. 2.

A small round boss bearing curved ridges after the manner of a dental bur is mounted on a slightly flexible shaft. The boss is 2.3 mm. in diameter (No. 7 French scale). After introduction through the slit canaliculus, the handle is twirled in the fingers, thus causing the bur to rotate in contact with the mucous membrane. The direction of the handle is altered to insure that all portions of the sac shall be curetted.

The instrument may also be used in the bony duct after the manner of the lacrimal duct reamer.

2. Lacrimal sac and duct applicator.

This instrument is similar in all respects to No. 1, but is made of hard oxidized silver. It will hold a wisp of tightly wound cotton securely, and, being made of silver, will not rust when brought into contact with Tr. Iodin.

3. Lacrimal sac reamer. Fig. 3, and Fig 4.

This instrument is similar to a dental reamer, but is made shorter and with a rounded blunt end. It is mounted on a slightly flexible shaft. It has five curved ridges so sloped that when the handle is rotated, the forward passage of the instrument is facilitated. Its action is similar to that of a corkscrew. The diameter of the reamer proper is 3 mm. corresponding to No. 9 French Scale.

4. Is similar in all respects to No. 3, but is 3.2 mm. in diameter, corresponding to No. 11 French Scale. The reamers are used in a manner precisely similar to the use of Buck's curettes as described in the text.

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RECURRENT SPONTANEOUS RETINAL HEMORRHAGE OF PROBABLE TUBERCULAR ORIGIN

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This paper discusses a disease entity occurring in the young, with definite symptomatology and clinical course and generally unfavorable prognosis; and reports a typical case in which hemorrhage in the left eye was followed by retinitis proliferans, new blood vessel formation in the vitreous, complete detachment of the retina, and total blindness. In spite of repeated hemorrhages, the right eye still retains 20/15 central vision but with much restricted visual fields and a few vitreous opacities, more than a year after the recurrence of the last hemorrhage.

A perusal of the literature on the subject of vitreous hemorrhages impels one to recognize that among all these cases of varying etiology, there are quite a number evidently due to tubercular involvement of the retinal vessels, more especially the veins, which have a definite symptom complex in common; and it is to the consideration of this group of cases I mean to confine this article

Among predisposing causes may be mentioned sudden changes of temperature, exposure to cold and wet, malnutrition, hereditary diseases and tendencies, anemia, vascular disease, premature development, menstrual disturbances, and undue sexual excitement and abuse. (Gehrung 1.) To these may be added constipation, indigestion, worry, great mental effort, and hereditary tubercular tendency.

Tuberculosis has never been absolutely demonstrated to be the etiologic factor in these cases, however, the observations and investigations of numerous ophthalmologists furnish very convincing evidence of the probable presence of tuberculous germs and toxins in the many cases reported in the literature.

The attention of the profession was first directed to tuberculosis as a probable etiologic element in vitreous hemorrhage in an article by Manz (2) published in 1890. These observations were supported in 1897 in an article by Weeks (3). Following this the literature contains many articles and case reports on the subject, among which are those by Noll (4), Kyrieleis (5), Knies (6), Axenfeld (7), Knapp (8), Cords (9), Igersheimer (10), Fleischer (11), Oloff (12), Friedenwald (13), Otori (14), Jackson (15), Davis (16), Agricola and Thies (17), Mayou (18), Spencer (19), Fuchs: Duane (20), de Schweinitz (21), Roemer (22), Collins and Mayou (23), Parsons (24) and F. Park Lewis (25).

Spencer in his article reports thirty-two cases in which diagnosis of tuberculosis was made, in most instances by the tuberculin reaction. This number includes three of his own, in one of which the patient also had pulmonary tuberculosis.

In two cases reported by Igersheimer the patients were also afflicted with pulmonary tuberculosis, while one of Axenfeld's cases had numerous tubercular lesions in other parts of the body.

In a case of Fleischer's in which enucleation was performed, "the retinal veins were found filled with tuberculous debris."

The reports of two cases by Otori, are of unusual interest in that in each case the eye was later enucleated because of inflammatory conditions of the iris. Pathologic examinations revealed extensive destruction of the retina, and in each case he was able to positively demonstrate tubercular germs in the retinal tissue. He considered the one case a primary tubercular retinitis and the other secondary to tubercular involvement of the nerve head.

According to the observations of Fuchs, Schoeffels and others, the beginning process is a perivasculitis along the course of the veins, which microscopically shows a round, giant and epithelial cell infiltration.

Owing to the fact that the condition primarily involves the perivascular tissue rather than the vessels themselves, it would seem that the bacilli do not gain access thru the blood-vessels, and

Mayou is of the opinion that the infection travels along the nerve-sheaths. This opinion is also concurred in by Parsons who believes that the infection travels along the lymph stream within the nerve sheath.

Later, as the vessel walls become eroded, hemorrhages occur into the vitreous, or between the retina and the hyaloid, producing the so-called subhyaloid hemorrhages. Organization of the clots results in the formation of dense fibrous masses which become adherent to the retina and produce a condition known as retinitis proliferans.

Contraction of these fibrous bands results in a detachment of the retina, and the subretinal space fills with a thin straw-colored fluid. There is also new blood vessel formation in the vitreous and the retina shows areas of necrosis and degeneration.

Epistaxis is often a forerunner of the disturbance and it has been noted in several instances that cessation of the epistaxis marked the occurrence of hemorrhage into the vitreous. For this reason Kyrieleis recommended venesection and even ligation of the carotid on the affected side.

Systemic symptoms are usually absent altho as noted, in some instances, tubercular lesions were found to coexist in other parts of the body. Blood-pressure and coagulation time are usually normal.

The patient presents himself complaining of spots before the eyes, sometimes merely black specks and at others spots of a reddish color. Generally within a few days hemorrhages occur into the vitreous or between the retina and hyaloid. These hemorrhages may be brought on by a fit of coughing or sneezing, by blowing the nose violently or following violent exercise such as playing games, dancing or laborious effort. They may, however, occur spontaneously and in spite of all precautions. The occurrence of hemorrhage is accompanied by peculiar sensations within the eye, hardly severe enough to be designated as pain, but the patient is cognizant of some unusual sensation within the eye-ball. Simultaneously there is a dimming of vision or a limitation of the visual field, and if the hemorrhage is large, the vision may be completely obscured.

In the early stages the central vision is usually not reduced, as the affection is prone to follow the course of the vessels and hence the macula is spared. If opacities are very abundant or if the hemorrhage intercepts the visual axis, there is, per se, a corresponding diminution of the central vision.

Scotomata corresponding to the affected areas of the retina are found even early in the disease and are of considerable diagnostic importance. As the degeneration advances, the visual fields diminish concentrically, the color fields for green and red showing even more rapid reduction than the general field.

External examination may or may not reveal evidences of the trouble within, depending upon the secondary involvement of these parts. Early in the course of the disease there is not likely to be any external evidence of the retinal disturbance but as the condition advances a slight circumcorneal and ciliary injection may be noted, especially just preceding and following the occurrence of hemorrhage. The tension remains normal until hemorrhage occurs when, if the hemorrhage is large, it is slightly higher.

The ophthalmoscope reveals the presence of flaky opacities in the vitreous. The disk may be sharply outlined or present a fuzzy appearance around its margins. The vessels are normal in size and proportions, but the veins are paralleled by broad white bands. As the condition progresses, small hemorrhages proceeding from the veins are observed either subhyaloid, in which case they present a sheet-like appearance, or directly into the vitreous. While the first hemorrhages are usually small, this condition does not always obtain; and in some cases the first rupture of the vessel walls may result in a very extensive outpouring of blood, even to the extent of completely obscuring the view of the fundus.

A subhyaloid hemorrhage of any great extent presents a characteristic picture in that the upper border forms a straight line across the fundus.

A striking characteristic of this disease and one that might be considered almost

pathognomonic is the rapidity with which even quite extensive extravasations of blood are absorbed, in contradistinction to that of other intraocular hemorrhages which is discouragingly slow. The absorbtion is often complete, or so nearly so that only a small whitish opacity remains.

The retina shows white patches of degeneration especially along the course of the vessels and there is more or less retinal edema. The macular region remains remarkably free from the disturbance.

When the hemorrhage has been of considerable size, the resultant clot gradually loses its pigment, becoming whitish and assuming the appearance of a fibrous band extending across the fundus, the ends of which are attached to the retina by a fan-shaped structure of fine fibrous strands, leading one to believe that the entire structure was primarily an outgrowth of the retina; hence, no doubt, the name retinitis proliferans, which has been given to this condition.

As this band usually crosses the center of the vitreous, the macula and disc are often obscured. New blood-vessel formation is seen in the vitreous altho the mass itself has but a poor blood supply.

Contraction of this band of fibrous material may eventually result in detachment of the retina, the process beginning at the point of attachment of the band to the retina and extending quite rapidly until the detachment is complete from the disc margins to the ora serrata.

The accompanying epistaxis is to be taken into consideration in making a diagnosis and the marked tendency to recurrence and the rapidity with which the hemorrhage resorbs are characteristic.

Vitreous opacities and scotomata which, as the condition progresses, result in limitation of the visual fields and total blindness are added diagnostic features.

The diagnosis of tubercular infection rests practically wholly on the tuberculin reaction and this has proven positive in many of the cases reported. The test can be considered merely confirmatory, however, as coexistent tubercular localizations in other parts of the body may render the test positive; it is in itself too far from infallible to be relied upon

As the patient is not likely to appreciate the connection between indiscretions of a general nature and the local condition in the eye, a careful history is of prime importance to ascertain the predisposing causes. The importance of the correction of such elements and the establishment of a proper hygienic regimen should be thoroly impressed upon the patient at the outset and he is to be made to understand that there can be no relaxation of these precautionary measures. Residence in the country with moderate outdoor exercise and nourishing food, especially eggs and milk, will prove of great benefit.

Injections of normal horse serum and of human serum have been tried, but the results have not been such as to warrant placing much confidence in them. However, they should be tried, especially on the occurrence of a hemorrhage.

Since the tuberculin reaction is found to be positive, the use of tuberculin for its therapeutic effect is indicated, and in fact it is probably the most potent single therapeutic measure so far available. Calcium lactate, adrenalin chloride and gelatin have all been used and may have some therapeutic value.

When hemorrhage occurs the patient should be confined to bed in an absolutely quiet darkened room. The head should be raised and cold applications made to the eyes and head. Injections of serum at this time may be of some value. Catharsis should be instituted and sweating produced by the hot bath, hot pack or pilocarpin.

To promote the resorption of the clot, pilocarpin sweats, Turkish baths, and potassium iodid and sodium salicylat may be used. Locally the condition should be treated with atropin and dionin.

The prognosis of the trouble is decidedly unfavorable, altho under careful observation and treatment the vision may be preserved for some time, especially if the patient can be placed in ideal surroundings with a close observance of proper hygienic regimen.

When retinitis proliferans supervenes, the condition is not amenable to further treatment and may progress to complete

retinal detachment and consequent total blindness.

Case: T. M. C., age 21, single, salesman. Came under my care April 6th, 1917, complaining of loss of vision in the left eye and floaters before the right.

Family history: Father 64, mother 50, two sisters and one brother all in good health. No eye or specific trouble in the family. Mother's two sisters and one brother died of tuberculosis.

Personal history: Ordinary diseases of childhood, also pneumonia at six years of age. Tonsillitis for six years, tonsillectomy being performed in 1915 in hope of relieving trouble in left eye. At the same time turbinectomy was performed on both sides; and some teeth extracted after x-ray had revealed the presence of abscess. Denies having had specific venereal trouble. Does not drink alcoholics and uses tobacco only moderately. He is, however, given to excessive sexual indulgence and this may have been an important etiologic factor.

He states that in August, 1915, he awoke one morning with a peculiar sensation in his left eye. He went to an oculist who pronounced the trouble neuroretinitis. Two days later he had an intraocular hemorrhage which resulted in practically total loss of vision. About two weeks later, hemorrhages recurred and eventually became organized so that he never again regained his vision.

In spite of several negative blood Wassermanns and lack of luetic history either of inherited or acquired syphilis, he was put on antispecific treatment without beneficial results.

Physical examination: Weight 145 lbs. Height 5 ft. 8 in. General appearance, fairly well nourished, nervous temperament, but not manifestly so.

Chest: Lungs, rales in lower left lobe.

Heart: Rate 65, tones regular.

Blood-pressure: Systolic 102 mm. Hg. Diastolic 82 mm. Hg.

Blood-examination: Coagulation normal. Hemoglobin 78 per cent. Erythrocytes 4,387,000. Leucocytes 8,850.

Spinal fluid was taken but technic of Wassermann test was faulty so that no reliance could be placed in the finding.

April 6, 1917. Ocular examination. V. R. E. 20/30, 20/20 with plus .75 cyl. axis 90. V. L. E. Light perception. Fields normal for right eye. Tension normal. No conjunctival reaction.

Ophthalmoscope. R. E. Dust-like opacities in the vitreous with perivasculitis along course of large superior and inferior temporal veins.

L. E. Typical picture of retinitis proliferans, a broad bluish-white band extending diagonally across the fundus from the superior nasal to the inferior temporal quadrant, and practically completely covering the disc. The central portion was dense and fibrous while the ends were spread out fan-shaped and were thinner and granular in appearance. No blood-vessels were visible in the mass, but the retinal vessels could be distinctly seen running under it.

On April 15, 1917, the patient was brought to the office with only light perception in each eye. The ophthalmoscope revealed a large hemorrhage in the vitreous of the right eye, apparently coming from the superior temporal vein.

He was given an injection of coagulose at once, which was repeated a few days later, and ordered to take large quantities of gelatin, five grains each t. i. d. of calcium chlorid and potassium iodid, and a daily sweat by means of a Turkish bath.

Tuberculin injections were begun and were kept up with increasing dosage and lengthened interval for the next six months.

Within a week the eye had cleared markedly and on April 28, two weeks after the occurrence of the hemorrhage, the vision was again 20/25 in the right eye altho a large black clot was plainly visible floating freely in the vitreous.

The same night a second hemorrhage occurred, again reducing the vision to light perception. The vitreous now contained a large clot completely obscuring the fundus. The same treatment was used and in about two weeks the vision was again 20/25.

In July, 1917, another hemorrhage of less severity occurred and the same treatment was repeated with equally gratifying results, so that in about one

month the vision had again returned to 20/25.

At this time the patient was in rather poor health and was coughing a good deal, hence another pulmonary examination was made which, however, did not reveal anything definite, altho tuberculosis was suspected.

He was advised to seek out-of-door employment and severely admonished regarding sexual indulgences. Following this advice he soon regained his former health and his general appearance and weight improved.

In October, 1917, examination of the left or blind eye revealed detachment of the retina which had been progressing gradually for several weeks, and the fibrous band seemed to have broken up into numerous small pieces which were scattered thruout the vitreous.

On May 1, 1918, the vision in the right eye was 20/15 with a plus 0.75 cyl. axis 90°. He has had no new hemorrhages since July, 1917, about ten months, opacities are still present in the vitreous including the remnants of the large hemorrhages which are to be seen in the lower part of the globe. The vessels of the superior temporal quadrant and those just below the disc, still show scars of the perivasculitis and retinitis.

The visual field is limited to 30 degrees above and below, 20 degrees to the nasal side and 60 degrees to the temporal side. The fields for red and green are limited to ten degrees in all directions.

The left eye is totally blind, there is complete detachment of the retina, and and the vitreous is filled with organized material containing new blood-vessel formations.

E. A. Davis (16) gives a report of a case which bears a remarkable similarity to my own, in which he used a very similar line of treatment but with rather discouraging results. The ultimate outcome of his case was complete blindness in the right eye and only fingers at 10 ft. in the left. I only recently found this report hence my treatment was worked out entirely independently, so that I was unable to avail myself of much of his valuable experience.

At the present time, Oct. 18, 1919, patient has 20/25 vision with a very cloudy vitreous.

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CAUSES OF BLINDNESS IN EGYPT

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These statistical tables based upon official hospital reports give the most accurate idea of the prevalence of blindness in Egypt, and its common causes.

During the year 1918 we examined nearly nine thousand (8969) patients who were blind in one eye and more than four thousand (4261) who were blind in both eyes. (Table I.) This means that more than four and a half (4.7) per cent of all the patients were blind in both eyes and ten per cent (9.9) in one eye.

Of course we depend on the hearty coöperation of all surgeons but especially of the principal medical officers in recording all cases of blindness.

Table I. Blindness.

Year	Total No. of patients examined	One Eye No.	One Eye %	Both Eyes No.	Both Eyes %	One Eye and Both Eyes No.	One Eye and Both Eyes %
1906	40,103	1,297	3.2	633	1.6	1,960	4.9
1907	24,416	1,450	5.9	697	2.8	2,147	8.7
1908	19,614	1,189	6.0	852	4.3	2,041	10.4
1909	22,373	2,116	9.4	1,385	6.1	3,501	15.6
1910	25,506	2,438	9.5	2,010	7.8	4,448	17.4
1911	31,274	3,196	10.2	2,811	8.9	6,007	19.2
1912	43,668	4,115	9.4	2,824	6.4	6,939	15.8
1913	62,233	5,360	8.6	3,878	6.2	9,238	14.8
1914	75,398	6,425	8.5	3,591	4.7	10,016	13.2
1915	71,930	5,637	7.8	2,992	4.2	8,629	12.0
1916	94,447	7,042	7.4	3,504	3.7	10,546	11.2
1917	100,410	9,385	9.3	4,611	4.6	13,996	13.9
1918	90,668	8,969	9.9	4,261	4.7	13,230	14.6
Total..	702,040	58,619	8.3	34,079	4.9	92,698	13.2

The definition of blindness adopted at the Egyptian Ophthalmic Hospitals is inability to count fingers held up at a distance of one metre from the patient.

In the following table are shown the percentage of cases examined who are blind in one or both eyes at the various hospitals. (Table II.)

This percentage is seen to vary from twenty per cent at Minia (20.6) and Assiut (20.2) to seven per cent at Faraskur (7.2). There is no doubt that the higher rate is significant of great care and industry on the part of the principal medical officer.

The age at which patients became blind is of great importance for any study of the prophylaxis of blindness and of the diseases which lead to it.

Of patients under one year of age only about one and a half per cent (1.42) were found to be blind of one eye; from one year to five years, three and a quarter per cent (3.29); from six to ten years, four and a quarter per cent (4.33); from eleven to fifteen years, five and a half per cent (5.56);

Table II. Total Percentage of Blindness in One or Both Eyes.

	1914 %	1915 %	1916 %	1917 %	1918 %
Permanent Hospitals:					
Tanta	11.	8.1	5.3	9.2	8.8
Assiut	14.2	10.1	11.7	18.4	20.2
Mansura	18.6	15.3	16.6	13.2	13.9
Beni Suef	16.7	16.3	13.2	16.0	16.9
Zagazig	15.9	11.1	9.3	15.0	15.9
Damanhûr	16.8	11.4	11.8	13.5	12.9
Shebin El Kôm	18.5	11.9	11.8	10.2	12.3
Sohag	19.7	15.3	14.3	14.03	14.7
Minia	...	22.06	20.7	30.7	20.6
Fayûm	...	...	11.06	13.0	18.2
Mahalla El Kubra	13.6	16.4	17.03	12.2	12.3
Kafr El Zayat	7.8	10.5	8.3	12.6	10.1
Santa	...	...	10.06	13.7	14.2
Traveling Hospitals:					
No. I. Camp—					
Shebin El Kanatir	21.7	11.8	...	...	...
Min a El Qamh	15.0	...	...	...	...
Kafr El Dauwâr	...	...	12.7	11.9	...
Qena	...	...	...	20.5	18.3
Benha	...	...	...	10.7	...
Alexandria	...	...	...	...	15.0
Aswân	...	...	...	...	12.8
No. II. Camp—					
Maghagha	22.9	...	...	...	...
Damietta	9.6	...	...	...	...
Barrage	...	5.8	...	...	...
Giza	...	...	10.5	12.6	11.1
Rosetta	...	...	...	15.7	...
Fûa	...	...	...	12.6	...
Embaba	...	...	...	...	15.6
No. III. Camp—					
Barrage	...	...	...	...	15.6
Assiût P. C.—					
Manfalût	5.3	6.7	...	8.9	14.7
Manfalût	8.3	...	...	...	...
Deirût	7.4	...	...	6.4	12.3
Mallawi	5.6	...	6.1	8.2	...
Abnûb	...	...	4.1	...	...
Abu Tig	...	...	...	9.6	...
Daqahlia P. C.—					
Mit Ghamr	16.5	4.7	7.9	...	8.2
Mataria	8.6	...	...	...	...
Dekernes	11.2	...	...	10.6	...
Faraskûr	...	...	7.1	...	7.2
Aga	...	...	...	22.3	14.2
Simbellawein	...	...	...	10.7	...

Table III. Blindness in One or Both Eyes per Age During 1918.

Hospitals	Under 1 year	From 1 to 5	From 6 to 10	From 11 to 15	From 16 to 20	From 21 to 40	Over 40 years	Total
No. 1 Camp	3	23	54	65	50	361	630	1,186
No. 2 Camp	5	37	41	59	78	476	329	1,025
No. 3 Camp	1	3	8	8	8	57	57	142
Tanta	19	35	43	31	40	231	237	636
Assiut	26	43	68	47	78	526	553	1,341
Mansura	4	59	33	64	35	331	246	772
Beni Suef	5	20	25	76	81	352	319	878
Zagazig	4	22	28	61	55	360	269	799
Damanhour	9	29	26	16	38	317	183	618
Shebin El Kom	13	22	28	42	65	268	208	646
Sohag	2	27	28	35	45	230	253	620
Minia	12	21	28	40	53	533	362	1,049
Faywa	35	23	42	43	66	391	493	1,093
Mahalla Kubra	10	19	11	20	20	124	176	380
Kafr El Zayat	9	14	13	12	12	189	53	302
Santa	12	8	13	19	17	147	194	410
Assiut P. C.	17	17	48	75	25	366	411	959
Daqahlia P. C.	3	14	36	23	28	113	147	374
Total	189	436	573	736	804	5,372	5,120	13,230

from sixteen to twenty years, six per cent (6.07); from twenty-one to forty years, forty and a half per cent (40.6); over forty years, thirty-eight and a half per cent (38.7). It is therefore a fact either that the majority of the blindness occurs after the age of twenty-one years or that the blind among the younger patients are not brought to the hospitals.

Table IV. Percentage of Blindness in One or Both Eyes per Age During 1918.

	Per cent of total examined.	Per cent of total blind.	Per cent of patients of this age.
Under 1 year	.21	1.42	2.93
From 1 to 5 years	.48	3.29	5.06
From 6 to 10 years	.63	4.33	6.21
From 11 to 15 years	.81	5.56	8.57
From 16 to 20 years	.88	6.07	11.77
From 21 to 40 years	5.92	40.60	19.96
Over 40 years	5.64	38.70	32.30

The average blindness being thirteen per cent (13.2), the small amount of blindness found among the patients up to the age of fifteen years (three to eight per cent) is remarkable. It is not until after the age of twenty-one years that the incidence rises sufficiently to produce the average of thirteen per cent.

The deduction to be drawn from this apparently is that the danger of blindness is vastly increased with the onset of years, and that this increases progressively from birth onwards. Incidentally it may be noted that ophthalmia neonatorum is extremely rare among Egyptians.

The ages of all patients treated may be of interest and these are given in the following table:

From an examination of the ages of all the patients treated we find that about eight per cent were under one year, ten and a half per cent from one to five years, eleven per cent from six to ten years, ten per cent from eleven to fifteen years, eight per cent from sixteen to twenty years, thirty-two and a half per cent between twenty-one and forty years and nineteen per cent over forty years. It is therefore evident that some children are brought to the hospital.

Table V. Patients Treated per Age During 1918.

	No.	Per cent
Under 1 year	6,434	7.81
From 1 to 5 years	8,607	10.45
From 6 to 10 years	9,213	11.19
From 11 to 15 years	8,483	10.30
From 16 to 20 years	6,826	8.29
From 21 to 40 years	26,904	32.68
Over 40 years	15,849	19.25
Total	82,316	

To determine the cause of the increased liability to blindness with advancing age requires a study of the prime pathologic causes of blindness which are noted below.

From this it is seen that altho cataract (7.72 per cent) and glaucoma (10.96 per cent) account for a considerable amount of blindness found, the main cause is conjunctivitis (73.39 per cent) of all kinds, resulting in total corneal opacity, shrunken globe, secondary glaucoma and various other conditions unspecified in the statistics.

We come back to acute conjunctivitis as the most important cause of blindness. Trachomatous conjunctivitis is as you are well aware a chronic disease and does not frequently of itself produce blindness.

The amount of blindness due to glaucoma is noteworthy, more than one and a half per cent (1.62 per cent) of all the patients who seek treatment at the ophthalmic hospitals being blind from this disease.

Table VI. Causes of Blindness.

	1912	1913	1914	1915	1916	1917	1918	Total	%
Congenital	11	12	10	7	3	4	8	55	.06
Acquired:									
Conjunctivitis resulting in:									
a. Total corneal opacity	2,109	2,553	3,170	2,759	2,861	3,665	3,569	20,686	24.15
b. Shrunken globe	1,933	2,647	2,857	2,317	3,109	3.923	3,713	20,499	23.93
c. Secondary glaucoma	1,630	2,070	1,977	1,815	2,032	2,498	2,480	14,502	16.93
d. Other conditions	635	787	1,094	745	859	1,577	1.483	7,180	8.38
Fundus:									
Optic atrophy	151	100	119	90	145	178	195	978	1.14
Retinitis pigmentosa	20	29	19	12	23	22	24	149	.17
Various	203	305	184	182	152	254	194	1,474	1.72
Glaucoma absolutum:									
Monocular	536	553	638	657	695	893	751	4,724	5.51
Binocular	562	651	513	650	673	903	720	4,672	5.45
Cataract	486	930	862	797	1,053	1,201	1,287	6,616	7.72
Injury	47	63	47	70	56	148	92	523	.61
Operation	25	23	19	17	32	52	34	202	.23
Infectious diseases	4	27	19	19	2	32	11	114	.13
Iritis endogenous	184	224	165	94	160	277	209	1,313	1.53
Various	67	387	262	230	241	422	331	1,940	2.26
Total	8,603	11,361	11,955	10,461	12,097	16,049	15,101	85,627	

A NEW OPERATION FOR THE RELIEF OF CONICAL CORNEA

L. Webster Fox, M. D., LL.D.

Philadelphia.

This paper was presented at the meeting of the Section on Ophthalmology of the American Medical Association, June 1919. It is published here thru the courtesy of the Journal, A. M. A.

In a previous communication concerning the history and evolution of the treatment of conical cornea,[1] I emphasized my lack of confidence in the surgical treatment of the condition as then practiced, and expressed a preference for the use of variously shaped and sized opaque disks pasted on the surface of correcting lenses worn by the patient. These were in effect artificial pupils. The later work of Dr. Meyer Wiener in regeneration of the cornea and his subsequent operation for the relief of keratoconus,[2] together with my own gratifying results in transplantation of the cornea, encouraged me in the belief in the great reparative powers of the cornea and inspired me in the experimentation along the line of surgical treatment for conical cornea. As a consequence, I have evolved a surgical procedure that has given me results far beyond my original hopes and expectations, and I present it herewith for your serious consideration.

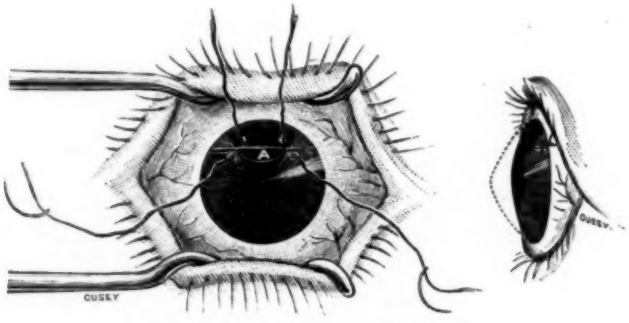

Fig. 1. Excised cornea; stitch in situ.

After preparation of the patient and the field of operation in the usual manner, the eyelids and the area surrounding the eye being thoroughly cleansed with a neutral soap, followed by a bath of benzin and alcohol, a 0.5 per cent. solution of tincture of iodin is applied, and the cocain anesthesia is produced, freshly made cocain solution being used. The eye is again irrigated with a 1:2,000 mercuric chlorid solution. Just before beginning the operation, 1 drop of atropin solution (4 grains to 1 ounce) is instilled. An eye speculum is then introduced. The conjunctiva is grasped a trifle below the inferior corneoscleral margin, slightly to the nasal side, and a Graefe knife is introduced into the cornea about 3 mm. above its horizontal meridian with the cutting edge inclined directly forward so as to bisect the cornea straight across, parallel with the horizontal meridian but above it. This requires considerable care and the exercising of good judgment, otherwise the pupillary area will be obscured by the final effects of the operation. It is better to be too high than too low. The inferior segment of the cornea is then depressed gently by the iris forceps, which are then inserted beneath the superior corneal segment so as to grasp a portion of the iris. This is then withdrawn and cut off by the de Wecker scissors. The upper margin of the inferior corneal segment is then grasped by specially constructed, small, straight, rather smooth forceps, turned slightly outward, and a semilunar strip of cornea is removed from the edge by means of small, strong scissors curved on the flat

(also specially devised for this procedure, after the model of Lagrange). This strip of corneal tissue is about 2 or 3 mm. wide at its thickest portion, from 5 to 7 mm. long, and involves the entire thickness of the cornea. A fine silk suture is introduced through the adjacent edges of the original incision and does not regain its conical shape as convalescence progresses. There is a certain amount of scarring.

My results in ten cases from this operation have been most gratifying; in fact, the best I have ever obtained from any form of treatment for this annoying condition.

Fig. 2. Forceps for grasping cornea.

on either side of the pupil and then tied in the following manner: Specially constructed forceps, with an incomplete fenestrum at the end of either blade, are used to grasp the margin of the upper segment of the cornea which is thereby everted. While it is everted the needle carrying the suture is passed

There is nothing new under the sun, and just here I take the liberty of quoting from my article on this subject,[1] in which I show the operative treatment as followed out by M. Desmarres, Bull, von Graefe, and Bader:

M. Desmarres advocated puncture of the cornea, after which light but long

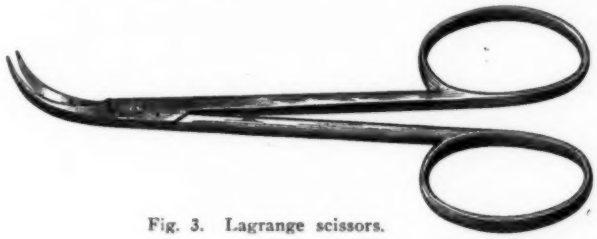

Fig. 3. Lagrange scissors.

through the fenestra and the corneal tissue. The forceps are released, the suture being disengaged by slipping through the break in the incomplete ring at the distant extremity of the forceps. This is repeated on the other side of the pupillary area in the upper margin of the corneal incision. The

continued pressure should be applied. Shortly afterward Mackenzie published the statement that evacuation of the aqueous humor was of no value whatever in this condition. Division of the recti muscles in conical cornea had been suggested some time prior to 1854, but was not seriously considered. G. J. Bull's

Fig. 4. Forceps with incomplete fenestrum at end of each blade.

sutures are then introduced in the lower segment of the cornea in a similar manner and tied. Atropin is instilled. The eye is irrigated and the usual dressing applied. There is very little reaction, as a rule, and the corneal sutures are removed at the end of eight days.

At the conclusion of the operation, the cornea is found to be materially flattened

recently reported case of astigmatism, in which a cure was effected by a complete subconjunctival tenotomy of the external rectus, indicates the possibility of relief in conical cornea by this means. Fario, an Italian surgeon, produced drainage of the aqueous humor by excision of three small portions of the cornea. Vision was improved by this procedure.

Von Graefe, in an interesting case of

conical cornea, produced ulceration of the apex of the cone and subsequent contraction and flattening of the cicatrix. His operation consisted in passing a very small cataract knife (von Graefe model) into the middle layers of the cornea just at the apex of the cone to the extent of about one line, after which it is withdrawn; a small superficial flap is thus formed, which is seized with a very fine pair of forceps and snipped off at its base with a pair of curved scissors in order that a superficial gap may be left at this point. Great care should be exercised in

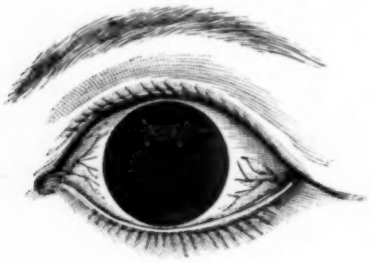

Fig. 5. Cornea after three months.

entering the knife to prevent its penetration of the entire thickness of the cornea; should this occur, the operation should be postponed for a few days until the perforation closes. On the day following the operation, a finely pointed stick of mitigated silver nitrate is lightly applied to the floor of the gap and immediately neutralized by a saline solution. The application is repeated at intervals of from three to six days until a slight, faintly yellowish infiltration is formed. Atropin should be instilled and a bandage applied to guard the eye from exposure. Improvement becomes manifest only after the infiltrate undergoes contraction, and this usually requires about five or six weeks.

Bader reported nine cases in which a more or less flat cornea was produced by the following method of treatment: A delicate curved needle, carrying fine silk or silver wire, is passed through the cornea in its horizontal diameter close to the point of the cornea to be removed. The point of the needle is then carried horizontally across the anterior chamber and is thrust through a point of the cornea opposite to the point of entrance and close to the portion of the cornea to be removed. The needle is left in the cornea until the top of the cone has been removed, as it serves to protect the lens. The head of the needle is held in one hand and the lower half of the cone is divided with a Beer's knife, the needle is then released, the small flap seized with iris forceps, and the rest of the cone removed with scissors. The needle is then drawn completely through the cornea and the ends of the thread tied so as to unite the edges of the wound.

I wish to state that the operation I have been carrying out has improved the vision from 3/200 to 20/30 in one case; and the average vision, under the proper correction of 20/70. Then, too, I have found that as time goes on the vision continues to improve, owing, evidently, to the contraction of the cicatricial tissue, giving the cornea a more spherical shape. I shall not give my final findings until the expiration of a year or a year and a half, thus to enable the cornea to flatten as much as possible. By the end of that time the operation will be thoroughly tried out.

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EXPERIMENTS ON RABBITS WITH SALVARSAN—THERAPEUTIC AND TOXIC DOSES

LT. JOHN ARNASON JOHNSON, M. C., U. S. A.

TACOMA, WASHINGTON

These experiments are reported from Camp Lewis, American Lake, Washington. Authority to publish granted, Board of Publication, S. G. O.

Several cases of syphilis with eye symptons examined in the Eye Section of this Base Hospital and several that were seen in the repeated examination and surveys of those under luetic treatment stated that the loss of vision of which they complained dated from the administration of salvarsan. At the suggestion and under the direction of Major Harry Vanderbilt Würdemann, chief of the eye, ear, nose and throat sections, and with the collaboration of the laboratory, the writer secured a number of rabbits and subjected them to large doses of salvarsan during the period of three months. The results of this follow:

Twelve rabbits were injected with a 1-10 salvarsan; the weight ranged 1100 Gm. to 1650 Gm. with one exception 980 Gm. The rabbits were given 1 decigram of salvarsan to a dose, excepting the three largest rabbits which were given 1.4 decigram for two doses. The salvarsan was injected into the veins of the ears.

Three of the rabbits died from the first salvarsan injection after three days. These eyegrounds were frequently examined but no changes were found. There was no postmortem examination made of these. The weight of these rabbits was 980 Gm., and 1410 Gm.

The fourth rabbit, weight 1100 Gm., died while it was getting its fifth salvarsan injection, twenty-nine days following its first injection and five days after the fourth. There had been no change in the eyegrounds noted. This rabbit was examined postmortem. The liver showed a large number of small hemorrhages, the other organs seemed normal. The brain, spinal cord, and urine were tested for arsenic and the laboratory failed to find even a trace.

The fifth rabbit, weight 1120 Gm., white, received six doses of salvarsan in thirty-four days, and then after a period of thirty-four days, it was given a final dose. The night following the second injection of salvarsan, while this rabbit was very listless, the guinea pigs ate nearly half of its right ear. The shock came very nearly proving fatal. Autopsy was held two days following final injection of salvarsan; findings were as follows: A very thin rabbit, liver showed numerous small hemorrhages, other organs were apparently normal. Urine was straw color.

The following seven rabbits, weight from 1140 Gm. to 1650 Gm., received ten injections of salvarsan in seven weeks, then they rested a month before getting the final dose. They were posted two, three, four and five days later. All the rabbits lost weight while they were given the salvarsan. During their rest period they gained a little. Rabbit No. 7 had an abscess on the back over the right kidney. Slides were made, the laboratory reported organism resembling streptococcus. Frequent examination failed to show any changes of the eyegrounds. This was corroborated by repeated ophthalmoscopic examinations by Major Würdemann.

Postmortem findings:

Liver showed more or less small hemorrhages, other organs seemed normal; the urine was a milky gray.

Following is the laboratory report by Francis B. D. Brown, 2nd Lt., M. C., U. S. A.:

Urine samples were all negative for albumin. A small amount from each sample was heated in a small size test tube until sample boiled gently. Addition of acetic acid cleared every tube showing absence of albumin.

The procedure used for arsenic is as follows:

From three to five grams of each sample was ground with a little concentrated hydrochloric acid in a porcelain mortar until pasty. More acid was added, making in all about ten to fifteen c.c. The resulting thin paste was transferred to a marked 250 c.c. Erlemeyer flask, about 3 g. of potassium chlorat, $KC10_3$, solid was added. After shaking well and standing until the foam subsided, the flask was placed on a boiling water bath and heated about twenty minutes. At intervals of about five minutes, small additions of potassium chlorat, 2 to 3 g. were made until no further change of color was observed.

After cooling, the liquid in the flask was added to a test tube containing free zinc to which a drop of copper sulphat solution had been added. A loose plug of cotton was placed in the neck of the tube to absorb any foam or splashing from the action of the acid on the zinc. A small piece of filter paper was placed over the tube and a drop of concentrated silver nitrat solution placed in the center. The presence of the arsenic is shown by the development of a lemon yellow spot on the silver nitrat paper after ten to twenty minutes. A drop of water turns the yellow spot black.

This is the Gutzeit test for arsenic and is one of the most delicate tests for this substance. It was found by separate test that .01 mg. of arsenious oxide, as 203 gave a marked yellow coloration turning dark when water was added.

Conclusions: These experiments, altho limited in number, show that these rabbits were thoroly impregnated with arsenic by the salvarsan injections. The dose of one decigram was lethal to but three; the others lived thruout the treatment and the postmortem examination showed a recovery of arsenic in the tissues examination. In none of the twelve rabbits was an optic neuritis produced. These experiments, taken in connection with the fourteen cases of optic neuritis discovered during the survey of patients before or during the treatment of syphilis in which the optic nerve lesions disappeared rapidly under salvarsan treatment, show that in these cases at least, arsenic has had no influence upon the development of an inflammation of the optic nerve; rather contrawise where neuritis had already developed, the specific treatment caused speedy resolution; thus it seems that the fear of production of blindness by therapeutic doses of salvarsan is unwarranted.

Table

	2 days after sal-varsan	2 days after in-jection	3 days after sal-varsan	3 days after in-jection	4 days after sal-varsan	4 days after in-jection	5 days after sal-varsan	5 days after in-jection
	5	6	7	8	9	10	11	12
Blood	++	++	+	+	+		+	±
Brain	+	+	+	++	++	++	++	++
Spinal Cord				+	+	++		+
Urine	+	++	++	+++	++	++	+	+

Trace of arsenic (less than .01 mg.) +++. Faint trace, ++. Very faint trace, +.

NOTES, CASES AND INSTRUMENTS

SPONTANEOUS RUPTURE OF MORGAGNIAN CATARACT

JOSE DE JESUS GONZALEZ, M. D.

LEON GTO., MEXICO.

This report was presented to the Section on Ophthalmology of the Fifth Medical Congress of Mexico.

The extreme rarity of spontaneous rupture of hypermature soft cataract makes this case of such interest to the observer that it is worth while to relate it.

Mrs. V. G., age 75, whom I have known for more than 30 years (the dates that I relate have been verified by myself) underwent, in 1898, an operation for cataract of the right eye, with complete success. The extraction was without iridectomy and without the least operative complication. The pupil stayed round and was contractile, and the visual acuity equally normal for distance and for reading.

As she was exceedingly nervous and timid, the good result obtained in the operation made her refuse operation on the left eye, whose cataract was complete and ripe at this time.

The years went by, the nonoperated cataract underwent the regressive modification which softened the superficial layers of the crystalline lens. The color had turned to bluish white; and this color, which varied with the change of position of the patient, made one think that a hardened nucleus existed.

One morning in the year 1912, fourteen years after she was operated for cataract in the right eye, without the eye receiving any jolt, or without the patient making any hasty movement or great physical effort, she experienced a sudden and acute pain in the left eye, accompanied by intense temporal and supraorbital pain, and a sensation of vertigo, followed by nausea and vomiting.

Next day she was brought to my office. There was intense pain and photophobia, which compelled the patient to cover the operated eye. The eye showed nothing abnormal except the operative aphakia. The left eye presented severe ecchymosis and conjunctival hyperemia. The anterior chamber was completely filled with a milk-white liquid. The cornea was transparent, but with the epithelium slightly dull, as seen in an attack of acute glaucoma. The tension was much higher than normal. Of the iris nothing could be seen. The eye was painful on pressure.

The diagnosis proved not difficult: A Morgagnian cataract which had formed in the left eye had unexpectedly and without apparent reason ruptured and had emptied its contents into the anterior chamber, causing an acute glaucoma.

If we remember the investigations on the pathogenesis of glaucoma by D. Uribe Troncoso (1) who has found an increase of albumin in the aqueous humor in glaucomatous eyes, making the filtration difficult through the canal of Schlemm, and causing the retention of liquid and hypertension, we shall not be astonished that the sudden and abundant outpour into the anterior chamber of thick liquid, heavily albuminous, may have caused a violent attack of glaucoma.

What caused the rupture? Probably the regressive action of the crystalline layers had invaded the capsule itself and by thinning it had caused it to give way.

The natural therapeutic indication would be the extraction of the liquid, by making a straight incision large enough to facilitate extraction of the nucleus, which, according to my belief, still was present. But the timidity of the patient, the advanced age (75 years), and her excessive nervousness, and not consenting to an operation, led me to prescribe instillations of eserin and applications of dionin 5%, until an intense lymphocytosis was pro-

duced; and steaming for fifteen minutes.

The pain ceased, the tension diminished, the absorption of the liquid was more noticeable from day to day, and within two weeks the anterior chamber became free from debris; the cornea remained transparent, the iris had regained its normal appearance and the pupil its form and its reaction. But the hardened nucleus still persisted, probably the capsular rupture cicatrized, and the pupil remained obstructed, opaque as before. The light sense was preserved and she could appreciate the difference in intensity of light and its direction.

I observed the patient five years from the date of the accident until her death, which occurred this year, and she suffered no return of glaucomatous attacks; but the nucleus did not absorb.

The only case similar to the one I have just described, which I find in the ophthalmic literature, is that of Rollet and Genet, (Rev. Generale d'Ophtalm, January, 1913), under the title, "Soft Cataract ruptured spontaneously into the anterior chamber." A blacksmith, 67 years of age, whose left eye had been operated for cataract seventeen years ago, the 27th of September, 1912, suddenly developed violent headaches, accompanied by vertigo and nausea, and localized on the right side. The right eye was much injected and where formerly he could see the light, he had lost all vision. Four days after this Rollet and Genet had him under observation at the hospital of Lyons; a light liquid filled the anterior chamber of the right eye with hypertension and pain. Eserin was instilled and the eye regained slowly its normal appearance, and in a month and a half the cornea was transparent, the anterior chamber normal, the pupil myotic, due to the eserin. The ophthalmoscope showed the ocular media transparent, the iris tremulous and absence of the lens. This patient, much happier than ours, recovered his vision after the accident.

My observation has the advantage that I knew the patient and had observed her cataract, while Rollet and Genet supposed the existence of the Morgagnian cataract which ruptured.

A CASE OF TRAUMATIC PULSATING EXOPHTHALMOS

R. S. Magee, M. D.

TOPEKA, KANSAS

The following history of a case is presented to you because of its rarity and its unusual cause, also, because I saw it soon after its beginning, and was able to follow it thru to its completion, noting its progress as it developed.

R. C., married, aged 24, was first seen by his physician, Dr. J. S. Stewart, Summerfield, Kansas, November 20, 1917. Family history negative; always been healthy; well nourished; farmer; active and cheerful.

Went out in the evening, November 18, 1917, to do the chores. While feeding the hogs and standing near a fence, stooped over to pick up an ear of corn and in so doing was struck on the left eye by a wire which stood up straight, the other end being fastened to the ground. He was stunned, became sick and vomited, followed by headache, with a queer feeling in his head for some time afterwards, when the eye began to swell. On November 28, 1917, ten days afterward, he was brought to my office by his physician.

Examination showed no marks of an injury to the eyelids or the eyeball by the wire. Ptosis, ecchymosis of the orbital and palpebral conjunctiva; and proptosis with immobilization of the eyeball, and some dilatation of the pupil. The muscles supplied by the 3rd, 4th and 6th nerves involved. The eyeball was fixed, looking straight ahead, vision undisturbed, practically $\frac{20}{xx}$. Complained of sensitiveness to light. Potassium iodid was prescribed and the patient sent home.

Three weeks later he returned. Double vision was present, the orbital tightness had increased. Proptosis more marked, intense rigidity of all muscular movements. Increasing headache. Bulbar and palpebral conjunctival congestion had increased, extending down into the lower culdesac. Ophthalmoscopic examination showed media clear. The disc and retina showed no apparent changes. Pupil showed some dilatation, not marked, unchanged by light. The veins in the skin of the upper lid were distended and tortuous.

The color of the overlying skin had assumed a dark cyanotic hue. At this time he began to complain of whistling or blowing noises over the left temple, asking me to listen to hear the noise. Said his wife could hear it.

Did not see him again until February 12, 1918. In the interim he had gone to Omaha to see Dr. Gifford. This time when he came back he had a pressure bandage over the left common carotid (making pressure) and trying to wear it. Said the discomfort was very great. The noises in his head had increased—blowing sounds he called them. Proptosis had increased to the extent that the lids failed to cover the globe. Immobilization complete. Vision reduced to one-half or less. Photophobia had increased. Pulsation of eyeball, synchronous with the heartbeat. A distinct bruit over the globe extending to the left temporal region could be heard. A marked chemosis of the lower half of the eyeball. The cornea showed a beginning haziness and blurring.

Under general anesthesia an examination was made of the postbulbar region by separating the conjunctiva and introducing the finger and passing it well back towards the apex of the orbit. Nothing was found. The pulsation, exaggerated, could be felt with the finger in the apex of the orbit. With the assistance of Doctors W. F. Bowen and H. O. Clark, the left common carotid was exposed, and the internal carotid was ligated just above the bifurcation. Immediately the pulsation ceased. Previous to the ligation the eyeball was removed. The opening in the anterior lacerated fissure seemed greatly enlarged, admitting the face of the finger readily, showing pressure absorption, likely because of pressure of the venous channels on the walls of the bony fissure.

A critical condition followed for two weeks. He remained in the hospital for four weeks. Partial right sided hemiplegia existed for some time. Difficulty in speech continued all the time during his stay in the hospital.

He could not be raised up in bed, would swoon away and lose consciousness, and once the nurse phoned that he was dying.

At the end of four weeks he was discharged from the hospital. Two weeks after going home, wrote that he still occasionally heard the noises, but several months later said that they had disappeared entirely. The edema of the orbital tissue was very slow in disappearing, in fact, did not disappear entirely, and still interferes with the perfect fitting of the artificial eye. At times patient says that the pulsating movement is still noticeable, when the artificial eye is being worn.

The excuse for enucleation was that the integrity of the globe was endangered by the beginning keratitis, also greatly hazarded by cutting off the blood supply following ligation of the internal carotid, and the prospective blindness resulting from atrophy due to pressure, which had already taken place and would likely continue; and the doubt of the globe returning back into the orbit to resume its proper location, should the swelling subside.

I cannot give the location of the aneurysm within the brain—I do not know—only I believe that it was in or near the cavernous sinus, making pressure there on the return blood from the orbit. My patient carried an accident insurance policy and had difficulty in making settlement, due to the fact of a doubt in the minds of the company as to the cause of the trouble, whether it was due to direct violence or not.

In looking up the literature I find the report of a much similar case by Bedell[1] in 1918. The patient was

down in a cellar stooping over, and quickly straightened up, struck her head in the right parietal region against a beam. The injury caused pain and dizziness for several days. The globe moved, but the internal carotid was ligated. The eye became permanently blind, the proptosis slow in recovering.

Mayou[2] reports a case caused by a fragment of shrapnel entering behind the right mastoid process. A bruit could be heard over the orbit and head and marked proptosis, with no improvement by ligation of the carotid.

Caillaud[3] reports a case of bilateral pulsating exophthalmos, due to injury from shrapnel, passing thru the maxillary sinus. Marked proptosis. Bruit could be heard on auscultation over the globe.

Augstein[4] reports a case of pulsating exophthalmos due to injury to the lower jaw. Marked proptosis. The exophthalmos and pulsation subsided following ligation of the carotids.

Key[5] reports a case of pulsating exophthalmos due to a severe blow on the side of the head. Five days after the injury first noticed a slight protrusion of the eyeball. A well defined bruit and pulsation could be heard.

Dodd[6] reports a case coming on one month after a severe blow on the side of the head. Marked proptosis.

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FOREIGN BODY IN EYE NEARLY TWENTY-NINE YEARS

J. H. Buckley, M. D.

FORT SMITH, ARKANSAS

J. M., miner, sixty-two years old, consulted me July 30th, 1919, in reference to a painful eye. Tension was normal, iris appeared muddy, pupil small, pear shaped, large end toward nasal side. Hypopyon measuring four mm. across top surface and two mm. vertically through center. Scar through limbus temporal side running transversely three mm. long, one and one-half mm. in cornea, balance in sclera. Ciliary zone in neighborhood of scar slightly pink. Absolute absence of light perception in all parts of field, also absence of pupillary light reflex. I advised patient to have the eye removed; that if he did not do so, and that if he lived long enough he would lose vision in the other eye. He said, "That is what Dr. ——— told me twenty-nine years ago." I sent him to Spark's Memorial Hospital and removed the eye that day.

On September 7th, 1890, while using a hammer cutting a rail for a railroad company in Virginia, a sliver from the steel cleaver he was striking struck him in the eye. He experienced pain at interrupted intervals until after Christmas, at which time the eye became quiet, and remained reasonably so until April, 1919, when it began paining him and continued to do so until I removed it. Upon opening and inverting the enucleated eye I found imbedded in the upper anterior quadrant of the choroid a piece of steel three mm. long, one and one-half mm. wide and three-fourths mm. thick, one end being only one mm. from ciliary body. It is quite interesting and I think unusual that a foreign body remained twenty-nine years, less five weeks and three days, within an eye, without causing more pain and reaction than this did. No history of sympathetic irritation obtainable.

SOCIETY PROCEEDINGS

NETHERLANDS OPHTHALMOLOGICAL SOCIETY

FIFTY-THIRD MEETING

Utrecht, June 9th, 1918.

Translated from the Nederlandische Tijdschrift v. Geneeskunde, October 26th, 1918, by E. E. Blaauw, M. D.

Demonstration of Cases.

PROF. H. SNELLEN demonstrated a case of *Traumatic Aniridia* after injury with a tobacco box; a severe form of *Choroidal Tuberculosis,* a patient with *Optic Neuritis,* or perhaps rather *Pseudoneuritis.* Specimens were shown of an eye, which clinically had appeared as a *sarcoma,* that had proliferated from within outward, while the pathologico-anatomic examination showed an ectasia consequent on *Intraocular Tuberculosis.*

DISCUSSION.—Nicolai had seen in a patient, with headache, a monolateral typical papillitis with normal vision, which remained unchanged during 4 years; he presumed that this was not a true papillitis.

Rochat asked about the adaptation, which perhaps may show some disturbances, after Behr's investigations.

Snellen replied he had not had time for complete examination.

DR. L. H. VAN ROMUNDE demonstrated *Ophthalmoscopy* with *red free light,* after the method recommended by Vogt.

Heterochromia and Melanosis.

DR. J. P. WAARDENBURG found since his publication in 1915 (Ophthalmology, Vol. XII, p. 106), 3 more cases, which gives 0,085 per cent of his patients. Augstein found 0,050 per cent; 6 patients in 12,000.

CASE 1. Lady 43 years old, with about symmetric, nearly vertical pigment streaks at the posterior surface of the cornea. They were broadest and pigmented the thickest just below the corneal center, 2 to 2.5 mm. Towards the periphery the individual particles are well recognizable. The color of the eye was gray with some yellow pigment in the small iris circle.

CASE 2. Lady 38 years old. V. = 5/5. O. D. no changes. O. S. in the pupillary space shows pigment spots against the lens capsule, while a horizontal fine pigmented streak is seen against the posterior wall of the cornea. This streak is dark brown, sharply circumscribed, has the length of about one-third of the cornea, and is ½ mm. broad. The iris is built of coarse trabeculae and brown.

CASE 3. Lady 54 years old. V. after correction 5/10 with a slight Ast. No changes with the exception of a very slight peripheral lens opacity. Against the posterior surfaces of both corneas small pigment streaks are seen, in V form, a little below the center, of about half the length of the cornea. The principal direction is horizontal, the sides of the V are slightly bent. The iris is brown.

CASE 4. Lady 40 years old. V. with correction for each of cyl. —3.5 = 5/10. The corneas have a diameter of hardly 10 mm. They are astigmatic with a horizontal curve of 46 D. and vertical of 50.6 D. The left cornea shows a few oblique, very fine, deep opacities, in between more clear spaces; while a small central part looks as a dull window, covered with extremely fine lightly pigmented points. In O. D., the fine pigmented opacities are much more numerous; they cover the paracentral and nasal side of the cornea entirely. The iris is blue gray with orange yellow pigment in small vascular circle.

Waardenburg believes that these 4 cases have a similar cause: *Congenital Melanosis,* the result of later pigmentation of the pupillary membrane after having grown together with the cornea, after formation of the anterior chamber; because all other affections are absent, the color particles are the densest centrally; and the condition is in both eyes, while other congenital deformities, corneal opacities, microcornea and astigmatism are present.

Melanosis corneae is derived from the stroma pigment, which is morphologically, and chemically different from and is formed much later than the ectodermal iris pigment. The gray and bluish eyes should then not be included in the eyes with melanosis. All data point in that direction. According to this conception the tissue elements, which remain in contact with the cornea, have genetically the same value as the iris cells and would have the same power of becoming pigmented about or after birth.

It seems that we have not to deal with true melanosis; viz. a hyperpigmentation exceeding the normal, but rather with a displacement of pigment. It seems to have only slight influence on the vision. The heredity could not be investigated. Slow and insufficient absorption of the *membrana pupillaris* seems hereditary. (This paper appeared as separate article in Tydschr. v. Gen. November 30, 1918).

Waardenburg refers to 3 cases of *melanosis iridis*. This condition appears mostly one sided, characterized by a diffuse dark brown to black brown coloring of the iris, with a change in the relief. Instead of a trabecular design one sees small warts intersprinkled with some larger papilloma-like enlargements. A reproduction of such a case shows, R. of a 15 years old girl with typical melanosis. The eye with the melanotic iris has some brown violet spots in the sclera, and a metal glossy fundus without visible intervascular spaces, on account of a dark tapetum.

The second case is that of a 13 years old girl with brown eyes, L. being temporally melanotic, with 7 large verrucae and nasally a jet black spot in the minor circle, while the nasal part is dark brown with green, not entirely melanotic—a case of partial melanosis in one eye with exceptionally black coloring of a part. This eye shows a slight corectopia and a white spot on the anterior lens capsule a remnant of pupillary membrane.

The third case is a 15 years old girl with marked corectopia R. up and L. down, luxation of lens in opposite direction, a diffusely colored iris without verrucae and without trabecular pattern. These eyes show pigmented spots at the posterior lens capsule where strings adhere, which connect the lenses with the ciliary region and seem to be stretched fibers of the zonule of Zinn. The last 2 cases do not show melanosis of sclera and fundus.

This condition of melanosis, which is an excess of pigmentation of one or more parts of the eye, and goes over in a fifth of the cases into melanosarcoma, must be sharply separated from heterochromia.

Waardenburg shows 3 typical cases of *Heterochromia*. Here the light eye is the sick one contrary to the melanosis. The prognosis of this light, sick, eye is favorable in so far that the secondary cataract can be extracted well and the cyclitis and vitreous opacities seem not to have a disturbing influence. A section of an excised piece of the iris shows as only sign of chronic inflammation, a large number of mononuclear cells with eosinophil granules in the iris stroma. Waardenburg did not observe Descemet spots in his 16 cases. He found now and then vitreous opacities. He found in 6 cases cataract, 4 cases were a true lusus naturae without any complication, one in a woman-sufferer of tabes and anisocoria, one with persistent hyaloid artery, one with sympathetic paralysis and 3 with congenital coloboma of iris, one of which showed marked remnants of pupillary membrane and anterior capsular cataract with coloboma of the choroid.

These last cases may not be classed with the typical heterochromia (Fuchs). On the contrary these eyes with congenital defects, showing the greatest deviations and the strongest pigmentation, without speaking of melanosis, must point to another explanation. In any case they cannot favor Fuchs' opinion, that the heterochromia is the result of pigment hypoplasia. Waardenburg wishes to consider it in connection with normal pigment disposition; his investigation of iris bicolor made it clear to him that

here not a complicated hereditary process can be alone considered.

DISCUSSION.— Faber saw years ago, in a 78 years old man with very brown irides and one sided cataract, brown excresences at the pupil margin, reminding one of ectropium uveae of horses. During the operation much pigment came free. He asks if this has been melanosis. He also saw once in a dog after a serious corneal inflammation much pigment appear in the cornea and conjunctiva.

Van der Hoeve had observed a number of cases of heterochromia with cataract but hardly ever missed symptoms of cyclitis with the corneal microscope; heterochromia with sympathetic paralysis is seen in young people, not in those where it originates in old age. The distinction between melanosis and heterochromia seems a little arbitrary. In a patient with original one sided melanosis, the other eye developed later vitreous opacities and cataract, pointing in the direction of heterochromia, so that here probably both conditions were present at the same time.

Waardenburg stated that cataract formation in the strongest melanotic eye seems to be rare. He insists upon the distinction of melanosis and heterochromia. It is however necessary to know the normal degrees of iris pigmentation.

Instrument for Examination of Hemianopic Pupillary Reaction, to be Attached to a Corneal Microscope.

H. WEVE has deviated from Hess' principle by having the light sources form their foci rather far out in the pupillomotoric zone. This made it unnecessary to verify for R. and L. separately. Weve has been able to verify his findings in a case of hemianopsia through hypophysis tumor with positive, and case of cerebral cortex affection (thrombosis) with negative hemikinetic reaction.

Senile Macular Changes and Senile Lens Opacities.

VAN DER HOEVE found during 1914 to 1918 in the Groningen Policlinic among 14,042 patients, of whom 1,336 are above the age of 60, in 329 eyes of 173 patients senile macular changes; increasing with age:

from 61-70 years in 6.125 per cent;
from 70-80 years in 23.04 per cent,
above the 80 years in 30 per cent.

The vision suffers very much. It is remarkable that senile lens changes were found so seldom and in so slight degree. If the macular change was very pronounced lens opacity was absent or very little. Is the lens opacity pronounced, then usually the macula deviation is absent. It follows that both changes cannot be due alone to old age.

Van der Hoeve admits an influence of light rich in *ultraviolet rays* on the appearance of senile lens opacities. He accepts as cause an affection of the ciliary body, which becomes affected thru diffuse dispersion in the lens, which he has demonstrated in 1911. The diffuse dispersion in the lens makes that a part of the incident light, and especially the ultraviolet rays deviate in all directions. The ciliary body becomes affected in its least resistant part—the secreting epithelium. This changes in the course of years the secretion of the nourishing fluids for the lens so that the lens begins to become opaque.

This diffuse dispersion protects the retina against a too large quantity of ultraviolet rays, and the speaker thinks that the senile macular changes may be explained thru excess of ultraviolet rays. As a preventive against these senile changes the modern yellow-green lenses are recommended.

DISCUSSION—Blok asked if many macular changes have been found in aphakics.

Snellen was sceptical as regards the ultraviolet light; the glassblower, who stands with his back to the fire, which even then contains less violet rays than the daylight, while a helper gives him the fluid glass mass from the fire, cannot get his cataract from the ultraviolet rays, rather heat must be influential. The quicker ripening of the cataracts in India and the prevalence among farmers could be accounted for by the

heat. Possibly the influence of heat on the body has greater significance than on the eye itself. It would be interesting to compare florists and movers, both equally exposed to light, the first doing light, the last heavy body-work.

Mulock Houwer thought that from the anatomic standpoint objections could be raised; as the degeneration does not remain limited to the center of the retina, but often extends widely. At the center the retina thru its thickness would have a protecting influence.

Rochat referred to the observation of Lindberg, who often saw the cataract preceded by a disappearance of the pigment of the posterior surface of the iris in the lower nasal quadrant, which was ascribed to the same rays.

Platenga observed an earlier presbyopia in the inhabitants of the tropics. He asked the speaker's opinion, if this also depends on the same influences.

Weve thought that euphos glass would be necessary, as common glass has the same protective influence. The question rises if cataract happens more rarely in myopes, who have worn their correction from youth on.

Nicolai asked the explanation of the fact, that some old people do not have any macular or lens changes, and how to explain the distinct tendency to familial affection sometimes found.

Van der Hoeve in his reply mentioned that naturally numerous influences exist, which can produce cataract, that his theory will not embrace all cases. He is willing to accept the possibility that families exist, where the dispersion in the lens is rather stronger, with a greater consequent production of cataract. He saw some macular changes in aphakic eyes, but one should not forget that probably more ten-year periods are necessary before the changes become manifest and that the aphakic eyes are protected by strong lenses. He agrees with Weve that common glass protects the eye, altho not absolutely. He called attention to Elliot's observation of retinal changes with cataracta nigra (that is with transparent lens), and that chorioiditis should so often be found in Eskimos. He does not blame the ultraviolet rays for the glassblowers' cataract, he rather suspects the ultrared rays, with Crookes and Vogt: This cataract begins in the pupillary space, and must therefore be of entirely different character. As to the ophthalmoscopic picture—the functional disturbance is more limited to the fovea, so that perhaps the more peripheric fundus changes are situated in the more internal retinal layers and then could be attributed to the stronger absorption in the thicker part.

Visual Acuity as Measure of Function of the Retina.

H. Snellen mentioned that the visual angle under which objects can still be recognized, is dependent on the clearness of the retinal images, the size of these images and the function of the retina. The last factor can only be determined by exclusion of all the other influences.

We have no trustworthy means to find out with opacities of the refracting media how much the acuity is diminished thru these, and how much thru a possible simultaneous retinal affection.

But even with exclusion of all other factors and acuity of 6/6, it is dubious if the retinal function is entirely normal. When the function of the retina has not fallen beneath a certain value the acuity is determined exclusively by the anatomic relations of the retina, namely the size and situation of the cones and rods.

Snellen wishes to explain in this way the asthenopia from anemia. As a rule they have a normal visual angle and a large accomodative power. Still they cannot read or work at a short distance, or cannot continue it. If they receive a slight help (a lens of + 0.5 D. is often sufficient) they are able to do so. One might think of a suggestive influence. Snellen thinks that another explanation should be given, namely; a slight neuroretinitis or insufficient nutrition of optic nerve and retina, which has diminished the function even if the visual angle is normal. The stimulus becomes weakened, is perhaps too weakly

propagated for automatic reflex production of the necessary accommodation. If the patient is helped with a weak positive lens the stimulus becomes enforced and the right amount of accommodation is produced, which otherwise can be gotten only with the most intense exertion.

An accidental observation confirmed that the retinal function even with full visual angle can be inferior to the normal. A patient cured of strabismus after tenotomy, examined for binocular vision by the Snellen Sr. method of the colored letters, while he had normal V. with both eyes, and with each eye separately could read the red or green letters, while using both eyes together, read with one eye all corresponding colored letters, and with the other only the largest. One might think that the patient on account of his strabismus suppressed the image of one eye. But Snellen found this also in patients who had never squinted. On the contrary he does not believe that the poorer function of the retina is caused by the squint, but that the formation of squint is favored thru the absence of a strong stimulus for fusion. Snellen also explains the fact, also mentioned by Straub, that with hyperopes, especially anisometropic hyperopes, in the weaker eye the hyperopia largely is manifest, in the other largely latent. The stimulus for the last eye is then strong enough to provoke immediately the right accommodation in the first eye, which lags thru insufficiency of the stimulus.

Discussion—Nicolai does not agree that the accommodation in the one eye may be provoked differently from the other.

Snellen not seldom found a quick reflex action from the good eye, and from the poor eye not such a quick response, and supposed that weakness of the retinal stimulus caused this. So a retinal disturbance can be supposed in anemic asthenopia, that the stimulus for reflex focussing is insufficiently strong, and only is reached after full attention; weak glasses may be sufficient to make the image so much stronger, that it produces a sufficient stimulus.

Roelofs mentioned the importance of distinguishing the observation-circle and the space sense and the significance of contrast. His visual acuity is 2 in clear weather, but distinctly less on dark days. The true light sense must be separated from adaptation; the first depends in high degree on contrast, the last one surely not.

Visser said that the difference in visual acuity between the two eyes becomes greater with the red green letters than with simple determination of vision. The function seems to increase during exclusion of the other eye.

Van Moll had, after extraction of the lens, important disturbance of his adaptation.

De Kleijn thought that a lower tone of the ciliary muscle could explain the less powerful action of the stimulus.

Snellen said that this might be possible, but that then the cause of the weak tone must be explained. It is probable that the tone does not develop on account of the two weak stimulus. Adaptative disturbance in aphakics was not rare formerly, caused, perhaps, by the too large iridectomy. A psychical exclusion, as Visser supposed, he did not think probable, as during reading each eye separately had the full attention.

H. Weve reported a case of Tertiary Lues of the Antrum of Highmore and the Orbit.

(Already published)

Discussion — Rochat demonstrated some slides of orbital gumma. He had received for examination the entire contents of the orbit of a man of some 40 years, where evisceration was done for tumor, with blindness and pain of the prolapsed eye. Lues was not suspected. A gummatous mass with caseation and endarteritis obliterans was found within the muscular funnel, which had partly grown around, partly infiltrated the nerves and bloodvessels. The recti muscles appeared much infiltrated, and caseous gummata were found in them. The paralyses were caused as well by diseased muscles as

by destroyed nerves. After this diagnosis a Wassermann was made and found positive.

Wibaut asks if sporotrichosis should not be considered.

De Kleijn considers the X-ray plate not typical for tumor, rather is against it, as the bony walls are not affected and the ethmoid could be involved. He is interested in the age of the patient as this condition seems mostly to affect old people. He observed it in a man of 48 years old, with symptoms of hereditary lues.

Weve states that in the literature no cases are reported of sporotrichosis with this picture. It could not be found in the specimen; also a secondary infection would not have remained absent. He remains of the opinion that a tumor gives a stronger shadow than an empyema. The affection seems to appear at all ages, sometimes with acquired lues 22 years after infection, sometimes in sufferers of hereditary lues at an age of 50-60 years.

Struggle of the Visual Fields (With Demonstration).

PROF. DR. W. P. C. ZEEMAN reported for himself and Dr. O. Roelofs, extending their former investigations, which showed that if different shades of gray are offered to each eye, one receives an impression between these monocular impressions. But if the difference is very great such a combination is not always possible, and it can come to suppression of one image or to alternating suppression, to struggle. The course of these oscillations was registered with the kymographion, which showed that the share of each eye was about alike, when the eyes were equal; that thru one sided diminution of contrast the share of one eye could be diminished. This was also studied in the periphery of the visual field. The presence of contours on one side did not exercise a demonstrable influence on the course of the struggle, even if these contours were in the same direction with the lines of the experimental object.

The influence of the ocular movements was more striking, and could mostly be explained by changes in distinctness of images and contrast, caused by these motions. The lines which are followed by the fovea, win over the lines on the other side, which are received on more peripheral parts of the retina.

These investigations also produced important data regarding the attention. This struggle registration in anisometropes demonstrates the different parts of either eye in observation, and the influence of the correction. It makes more understandable, why a one sided amblyopia is often found with hyperopia and very rare with myopia. Here both eyes are always directed at one point in the real world, and they can force their images with equal potency. In hyperopia on the contrary one eye is always adapted for a virtual far point, and the constantly blurred impression of this eye will remain inferior in the struggle. A more detailed account of these investigations will be published in the Archives Neerl. de Physiologie.

AMERICAN OPHTHALMOLOGICAL SOCIETY

FIFTY-FIFTH ANNUAL MEETING

Atlantic City, June 14-17, 1919

President, DR. LUCIEN HOWE, of Buffalo

(Continued from Page 691.)

Ocular Complications of Typhoid Inoculations.

DR. F. PHINIZY CALHOUN, Atlanta, Ga., called attention to the fact that our French confreres in ophthalmology have recorded such complications, notably herpes corneae with ulceration, retinal exudates, and hemorrhages following renal complications. The author reports five cases of uveal inflammations which immediately followed the first or second inoculation against typhoid fever. All had iritis. One had suffered from a previous gonococcus infection, and one gave a plus Wassermann; but the other three gave negative Wassermanns. All the cases recovered.

It has been suggested that eyes which had old lesions, such as corneal scars or iritis or choroiditis, are rendered more susceptible to the toxic actions of a foreign protein.

DISCUSSION: Dr. George H. Bell, New York, thought the cases very rare. He had seen only one, which he showed at the New York Ophthalmological Society, and also at the Academy of Medicine in New York. His patient, before he entered the Army, had a vision of 20/20 in each eye. He was inoculated with antityphoid vaccine twice. The first injection was followed by no complications. The second injection, which was given one week later, was followed by a chill, headache, malaise and rise of temperature. His eyes became inflamed. He could not keep his eyes open, and suffered greatly from the light. Both eyes became inflamed at the same time. He was treated in the Army Hospital for ten months. His vision when I first saw him was 5/200. He had a deep keratitis. The pupils reacted to light and the eyes were quiet. There were some gray opacities in the deep layers of the cornea. Seen with the naked eye, the opacities seemed uniformly gray; while with the magnifying glass, these opacities might be resolved into dots.

This patient has now been discharged from the army, and receives a pension from the Government. I have had him under observation since September 19, 1918; and there has been no improvement in his vision. I would also state that he has had two Wassermanns and a spinal puncture, all of which were negative. He has also had three injections of the old tuberculin, which were given in increasing doses without any reaction.

I think that all lesions that may occur after antityphoid inoculation and can be regarded as due to it, should be so regarded. No lesion should be ascribed to the inoculation that does not arise during or very shortly after the series of injections, until after a thoro investigation.

Dr. Walter B. Lancaster, Boston: I have seen no case of uveal inflammation that I recognized, but I have recognized a considerable number of cases of neuropathic keratitis. The first was so characteristic that it could not be easily overlooked. The patient was the commanding general of our camp. He had had the typhoid inoculation, which had made him rather sick. When I first saw him, he had herpes, cold sores on his face. Lesions on the cornea were, therefore, easily recognized. That was early in the establishment of the camp, so we had occasion to watch for these cases as the recruits came in and received inoculations. We saw, certainly, over a thousand; and probably over twenty cases my assistant made record of, and will perhaps make a report on this condition. The condition was not strictly ophthalmic, but neuropathic, and probably in the ganglia.

Vision of Aviators.

DR. W. H. WILMER, Washington, D.C., reported his further experience regarding the ocular function of aviators.

In selecting fliers, it is absolutely necessary to see that the eyes are entirely normal, for affections that are merely inconvenient on the ground, may be serious in the air. There are different types of fliers, and normality is more important in some of these than it is in others. When, in the course of training, errors of refraction become manifest, these should be corrected by means of appropriate lenses. There is a close correlation between successful flying and good stereoscopic vision. In case of weakness of the eye muscles, general rest and ocular exercises should be prescribed. A successful combat pilot, with trained air vision, who loses an eye may, in the exigencies of war, be seriously considered for return, under certain conditions, to a flying status.

In the classification of aviators, a cycloplegic should be used, and the fields for color and form should be recorded. Frequent reexaminations of flying officers are necessary. A short simple reaction time is of great value to the combat pilot, but only if associated with calm determination and well coördinated muscular action. No

quick, accurate method of testing ability for night flying has been discovered; and there are still many problems concerning the eyes in aviation remaining to be solved.

Discussion. Dr. Alexander Duane, New York: Dr. Wilmer's paper brings to my mind one point that I tried to emphasize this morning; and that is, that we must always consider whether the tests that we make actually show what we wish to determine, i. e., a man's real availability for the work that he has to perform. In other words, are the man's eyes, when tested, functionating under the same conditions as they do in actual practice? If they are not, then our tests, unless we make allowance for their fallibility, give us false ideas. To particularize,—Our ordinary visual test is one of sharp contrasts, i.e., of black letters on a well illuminated white ground, or *vice versa*. Never, in actual practice, has an aviator to deal with contrasts of this sort. On the contrary, he is all the time concerned either with objects (flags, semaphore signals, ordinary lights, moving bodies of men, roads, etc.) whose contrast with their surroundings is extremely slight, or else with those (e. g., search-light signals) in which the contrast is extremely vivid. Our laboratory tests should be used only as a preliminary examination, to eliminate the obviously unfit; the ultimate decision as to fitness resting upon examinations made under service conditions, and with objects in their service relations.

Capt. Harvey J. Howard, M. C., Mineola, L. I.: I have been working on recommendations of tests to be applied to aviators. We have recommended very strongly the use of a cycloplegic and the taking of the color fields, especially the peripheral color vision.

Dr. T. Passmore Berens, New York: In the American Expeditionary Forces, nothing had been prepared for research work, and it was so cold that it was actually impossible for us to handle the instruments.

About the time the Armistice was signed, we got into our regular place and had a well equipped room for the laboratory. It is to be hoped that the Mineola research place will be continued, so that it will not again be necessary to try to do such work under war conditions.

Dr. Allen Greenwood, Boston: I cannot let this occasion go by without calling attention to the wonderful work that Colonel Wilmer has performed for American aviation.

Dr. Nelson M. Black, Milwaukee: Office tests are not comparable to field tests. The objection to field tests has been that they consume too much time; and weather conditions are a factor in determining when and how they shall be made. But in every instance, the fact that office tests do not bring out the visual acuity of the men, especially for railway service, has been forcibly brought to our notice. The necessity arises for uniform methods of testing vision in these various conditions, so that the test shall be in conformity with the conditions under which the men will have to use their vision. Tests in accordance with the conditions under which the men fly are necessary in aviation examinations. They are also necessary for naval signalling, as well as distinguishing railway signals.

Dr. Lucien Howe, Buffalo: For the casual visitor to the laboratory at Mineola, it was interesting in the extreme to see the methods and their scientific accuracy. It was my privilege to go there frequently. At first, I went merely from curiosity; but I went afterwards as a student. I want to pay my tribute, also to the very great talent of those doing the work, and the high value of the work being done.

Dr. W. H. Wilmer, Washington: With regard to what Dr. Duane has said, I must acknowledge that he is always practical, as well as scientific. The very fact he brought out, that the laboratory or office test does not give a true estimate of visual acuity, we realized more and more. We did use Snellen's type, but we also employed Ives' test, in which wires are put apart, and then together more and more, until they make an acute angle, and then an angle no longer recog-

nized by the retina. That is a very good clinical test. I know that in the Ophthalmological Department they often took a man and made him stereoscope objects, just as he would have to do on landing with the wires, buildings, and trees. Just the things that they had to avoid. We tried to make the examination practical. We realized that a man might be physically perfect and perfect in pathologic reaction, and yet not be a good fighter or flyer; and, the reverse of this, we recognized that a man might not be in the best physical condition, but possess an aggressive spirit, a spirit of service, which would make him excel a man far superior to himself in these other respects. In this connection, I cannot refrain from mentioning G—, who had never been able to go a consecutive year to school. He was told then that he was, as some would say, nervously unstable. He was a good shot, but physically weak. When he became an aviator, he was shot down eight times and had innumerable accidents; but that wonderful spirit of his conquered all obstacles, and he was soon up and back again. On one occasion, he had just been shot down, and was supposed to be at home recuperating; but he slipped away to a neighboring airdrome, and went up without a machine gun and exposed himself to a German fighter until the latter had fired five rounds at him. Then he came back. When rebuked for his foolishness, he said: "It was not so foolish as you think. I have been told that a man who is shot down loses his nerve; and I wanted to see whether I had lost mine. I have not." The physical test is important, and the reaction time is; but if, on living with a man, you find that aggressive spirit, you have a man who is fit to fly.

Research Work of the Air Service.

Dr. Walter B. Lancaster read a paper on Research Work in Ophthalmology at the Medical Research Laboratory of the Air Service Division of the Surgeon General's Office, and its Bearing on the Teaching of Ophthalmology in America. He gave reasons for selection of the subjects chosen for investigation, and spoke of the work previously done at the laboratory. There was difficulty in getting research workers in ophthalmology. Most of the work on physiology of vision in recent years has been done by psychologists and physicists. Very little research on the physiology of vision is being done by ophthalmologists in medical laboratories, and some of that not very creditable, because of lack of training. On the other hand, the teaching of ophthalmology is inadequate because it lacks the stimulating influence of research.

A Test for the Judgment of Distance.

Captain Harvey J. Howard, whose paper was published in full in this Journal, p. 656, expressed regret that his attention had not, until today, been called to the valuable paper of Dr. Blaauw upon this subject.

Discussion—Dr. Alexander Duane, New York: I had the opportunity of visiting the laboratory and inspecting the apparatus that Captain Howard has described, and I derived three impressions from it: The first was the extreme precision of the test. In fact, as Captain Howard says, a very slight variation in the distance between two objects seen at a distance of six meters is instantly perceptible to the observer. The apparatus seemed very simple; and the test very satisfactory, accurate and precise.

The second impression that I gathered was the convincing evidence it gave that monocular vision gives us no perception of depth, in the proper sense of the word. That is supposed to be a truism, yet it has been denied recently, and it is satisfactory to see the convincing proof that we get. On closing one eye, that delicate perception of depth that we had before immediately vanished; and we could not tell where the rods were.

The third impression that I obtained was the most satisfactory of all. It was the impression of stimulation and inspiration to be derived from visiting an institution of that kind, and seeing what the men were doing there, the spirit in which the investigation was

conducted by all the men, the wholeheartedness and unselfishness with which they went into it, and the stimulation that came to the onlookers to go and do likewise. I wish that more had seen it. If they had, they would join in the wish that this work might be continued.

Dr. E. E. Blaauw, Buffalo: I wish to give expression to my great satisfaction with regard to this work. I should like to suggest that the instrument should be entirely black, without this shading, so that you do not get any reflection. In the third, I think that the two images used should not be those which give at six meters an impression of solidity. At the New York meeting of the A. M. A. there was expressed the opinion that binocular vision is of very little value. If the war has done nothing else, it has stimulated the belief that physiology is of great importance. I am grateful for this proof of it. This little instrument of Brooksbank James is not only of value in aviation, but also in determining the loss of the power of binocular function in accidents.

Dr. Allen Greenwood, Boston: I just want to call Dr. Howard's attention to a little instrument devised by Dr. Spearman of London. Instead of two posts, there are three. The third is on a movable carrier that you can set from beside the man you are examining. You cannot tell with one eye whether this middle post is between the others or not; but with two eyes, you can. If you have something that the patient can turn, the man who is being examined can make it possible for you to measure his binocular fixation and judgment of distance very well.

Dr. W. H. Wilmer, Washington: The description of Spearman's apparatus was in the part of the paper that I did not read. That is, I described Spearman's original apparatus, which is better than his last. The last has a milk-glass slide; but the light is of variable intensity at the back. Professor Spearman finds that his good fliers practically all qualify well, and that those who fly badly nearly all fail to judge well by this test. Its practical use has been of great value.

Dr. C. F. Clark, Columbus, O.: I was greatly impressed with the suggestion that there may be a permanent school for the study of these subjects. It occurs to me that as this is a thing largely a matter of measurements and standardization, we might appeal to the Bureau of Standards, who might be induced to take it up.

Dr. T. Passmore Berens, New York: When I first started to work at Mineola, we were all, of course, terribly interested in getting distances. Finally, we thought that there might be something in how quickly the man could react. We found that some men who had lost one eye could still make judgment of distance accurately and quickly; and that something that would record reaction time would be valuable. We also thought that it would be well to change the lighting. It is, of course, more difficult to fly at night than in the daytime. It is a question of putting the thing down to the conditions that the man would meet.

Another question was getting motion in the test. In an airplane a man has to make judgments of distance from his moving airplane.

Professor Spearman also thought that it would be fine to put motion into his own test. He had three bars, all movable; and all would be recorded on the chart at once; so that all during the test, while the man was trying to keep this bar in accord with the other to be recorded on the drum, you could see his judgment and fatigue all during the examination.

Dr. F. H. Verhoeff, Boston: It is doubtful whether Dr. Howard has determined really the minimal binocular parallax. It seems to me that it is questionable whether this test will decide the ability of the man to judge of distance. We want to know with what accuracy he judges distance, and not the slightest distance that he can judge, which is what this test shows. It is the same objection that Dr. Lancaster has pointed out, and other people. Whether these scientific tests are going to be the final standard, is a ques-

tion; because what you really want to know is whether a man can make a proper estimate of the distance between two objects. No one, so far as I know, has ever attacked that problem from the standpoint of binocular vision. Years ago, I thought of it, but was unable to devise an accurate method of making the test. There are really some objections to this method of testing the minimal binocular parallax.

Dr. David W. Wells, Boston: Is it possible that this smaller angle of stereoscopic acuity may be due to some monocular estimation of depth, from some shadow which might be inherent in the black rod on the white ground? It seems to me that Dr. Clark's instrument, which does away with the rod altogether, and substitutes this simple light, which is movable in the anteroposterior direction, theoretically is a more exact piece of apparatus.

Capt. Howard: In regard to what Dr. Blaauw mentioned, I would state that I did use dead black on the apparatus, and painted the rods black so that the only white surface seen was the background, on which the light fell and came on the rods from behind.

As for the apparatus of Dr. Spearman, I have not had an opportunity to see a description of it. Three posts are mentioned, two side ones and another middle one. I wish I had time to show the advantage of two posts over three. It was posible to show that the man would project one rod nearer than the other, while the other was really the nearer. There were twenty-three who did it. If we had used three rods, that would have been impossible. There is no reason for one man's projecting one rod nearer than the other, while another does not. It is largely due to a difference in visual acuity. I found that there was a difference in this respect between the two eyes. In my opinion, it would be better to have 20/20 vision in each eye than 20/20 in one and 20/10 in the other; because I found that a man with a difference in acuity between the two eyes is a poor judge of distance in using the binocular parallax test. Of course, when it comes to the motion parallax, as Dr. Blaauw mentioned, that is a thing that is extraneous to the individual. The motion parallax helps us all alike on the outside.

As to taking time exposures or methods of recording time, to see how quickly they could do it, I would say that in a new apparatus that I tried to design, and which Bausch and Lomb are making, I have included a shutter for the purpose of recording the time. I might mention that the value of the shutter in the simple apparatus, I found, was so great that I decided that the reaction time ought to be gone into and some results obtained on that. In regard to what Dr. Verhoeff has said about the visual angle and judgment of distance: I tried ten men in two different ways with both eyes open, and with only one open; and I found that the difference between the two rods varied from thirteen millimeters when both eyes were open to over two hundred millimeters when only one eye was open.

Regarding Dr. Clark's apparatus, I would say that it has been impossible for me, in this paper, to go into the bibliography and discuss what I had read. My paper would have been too long. I hope at some time in the future to take up that side. I was interested in seeing Dr. Clark's apparatus, a few months ago. My principal criticisms, which I told him at the time, were that the test objects were superimposed. I proved that you cannot determine the difference of superimposed objects, unless you get into the realms of the visual angle.

The Maddox Rod Screen Test.

Captain Percival Dolman read a paper on the Maddox Rod Screen Test. This investigation of the Maddox rod test was undertaken at the Medical Research Laboratory because of the variable and inaccurate results obtained with it, in examining the eyes of aviators.

A review of the literature reveals many criticisms of the test which support the conclusions of the laboratory. These criticisms are based on (1) The inability of some patients to see the

line of light; (2) the tendency of the line and the light to fuse; (3) the instability of the lateral distance between the line and the light; and (4) the tendency of the test to show excessive esophoria.

These phenomena were analyzed and their influence on the accuracy of the test explained. The Maddox rod combined with the screen test, the rapid covering and exposing of the eye while using the Maddox rod, overcome these imperfections. It is, in addition, a simple test of great delicacy and accuracy.

Discussion: Dr. Alexander Duane, New York: I have found the cover test useful in this way, combined with the Maddox Rod test, and put the red glass in front of the eye before the prism is put on, and then suddenly take it off, and see whether the images coincide; and if not, repeat this test with another prism behind the screen, until they do.

Dr. John E. Weeks, New York: In regard to the eye before which the Maddox rod should be placed, we are dealing in special practice with eyes that are defective in vision. Frequently one sees less distinctly with one eye than with the other, and it has been my practice to use the Maddox rod over the eye with the more distinct vision; obtaining in that way the results in the quickest possible time.

Capt. Percival Dolman: There is no objection that I can see to coloring the light (that is, to placing the red glass) before the eye that sees the light. Dr. Maddox himself has advocated that procedure in making the test—that the glass be placed over one eye, and the intensity of the light modified in this way. It seems that in the experiments that I have made with the screen over the patient's eye, the color of the light has lost its importance; the only thing necessary being to have it of such intensity that it will not irritate the eye.

As to the choice of the eye before which the rod is placed, I am not prepared to go into that; but I might say that invariably the eye that has the better vision, if there is a wide difference between the visual acuity of the two eyes, would better be covered by the Maddox rod.

The Study of Dark-Adaptation.

Captain Percy W. Cobb, M. C., Mineola, L. I., N. Y., read by invitation a paper on this subject. Tests of retinal sensitivity made under daylight conditions would appear to be of little value to the aviator who is to undertake night flying. The increase in light sensitivity that takes place in the dark has been the subject of numerous studies in the past, while the rate of recovery after exposure to light has had less particular consideration.

It is found that individuals vary widely as to their ultimate sensitivity, and also with respect to the rate at which they recover. These two factors are not, however, interrelated. The individual whose ultimate sensitivity is high is as often of as slow recovery as the night blind, and vice versa. The rate being as three to one in the two cases, where the exposures were respectively fifteen seconds' and five minutes' duration. Some improve rapidly for a time, then stop and afterward go on again.

Second Day

To secure a room suitable for the exhibition of lantern slides a session of the Society was held on Sunday afternoon.

Migration of Eye in Flounders.

Dr. Lucien Howe, Buffalo, N.Y., exhibited specimens of the young flounder and diagrams showing how, soon after its hatching, it swims like other fishes, and has one eye on each side of the head. As it develops, one eye moves around to the other side of the head, or in some species seems to pass directly thru. This brings both eyes on the upper side when the fish comes to swim with one side up and the other directed down.

Aviation.

Dr. W. H. Wilmer, Washington, D. C., demonstrated a series of the U. S. Army air medical films, showing the training of aviators, the conditions

of flight and movements required for attack and escape, together with the appearance of objects seen from the airplane in different positions.

War Injuries of Lids and Plastic Operations.

CAPT. JOHN M. WHEELER, M. C., Ft. McHenry, Md., demonstrated certain types of these injuries and the procedures required for their repair, including notching of the lid associated with laceration thru the tarsus, which should generally be prevented by careful apposition of the parts immediately after injury. Laceration of the lower lid from the inner canthus downward and outward requires thoro removal of the scar, advancement sutures, anchorage of angle of flap in slight overcorrection, drainage, and thoro relaxation of the connecting parts. Laceration of the lower lid near the inner canthus requires the use of minute flaps carefully adjusted and anchored in the connection. The bevel notch reducing overlapping of the flaps is of especial value for coloboma at the outer canthus. Subcutaneous grafts are used with anchorage of the conjunctiva and skin at the outer canthus for loss of upper lid. He showed outlines of operations of reconstruction of the lid and lid margin, dermic grafts were used for cicatricial ectropion. The danger of pedicle grafts is that they are liable to contract, causing increase of the deformity.

Multiple Vaccination of Eyelids.

DR. ARTHUR J. BEDELL, Albany, N. Y., read a paper to be published in full in this Journal.

DISCUSSION. Dr. Lewis S. Taylor, Wilkes-Barre: When we consider the lack of care given by many people to the vaccinated arm, and the liability of children to scratch the sore and then rub their eyes with the unwashed hands, it is surprising that more cases of vaccination in the eyes have not occurred.

In a somewhat large experience, extending over many years, I have seen but one case of this trouble. A number of years ago, I was called in consultation to see a child of about five years of age, with what we believed to be a genuine case of revaccination. He had a very much swollen and irritated lower lid, with some discharge; and inflammation involving the lower part of the cornea was present. He was sleeping in the same bed with his sister, and both children had been vaccinated, some time before. The boy, either from his own sore or from that of his sister, had been vaccinated on the eyelid; and there appeared this typical sore on the lower lid; the general condition being the same as Dr. Bedell has described. The case ran a typical course, and the child recovered without any ill effects.

If this condition had been in an adult, we might have thought at once of an initial lesion; as it resembled a chancre. But, there was the history of vaccination, with the still unrecovered sore; and I think that there was no doubt about the diagnosis.

Keratitis Profunda (Or Disciformis?), With Microscopic Examination.

DR. F. H. VERHOEFF, Boston, presented this as the first case of keratitis profunda reported in which the entire eye has been examined microscopically, and the second case of neuropathic keratitis of any kind, uncomplicated by infection, in which such examination has been made.

He concluded that disciform keratitis may be produced by a variety of causes, and from an etiologic standpoint is therefore not an entity. Certain cases of disciform keratitis are of the same nature as keratitis profunda.

The corneal changes in keratitis profunda are due to the action of diffusible toxic substances arising at or near the anterior surface. The changes consist in alteration of the epithelium, destruction of the corneal corpuscles, and injury to the stroma in the anterior layers of the cornea, and proliferation of the corneal corpuscles behind and around the injured area. In addition, there is injury to, or destruction of, the endothelium, and in severe cases deposition of fibrin and leukocytes on Descemet's membrane behind the af-

fected area. Leukocytic infiltration of the corneal stroma is conspicuously absent.

The microscopic findings in the present case strongly indicated a neuropathic origin for keratitis profunda.

Discussion. Dr. William Zentmayer, Philadelphia: I just want to speak of one point. My recollection is that Dr. Blaauw exhibited a case that had been historically studied, and in which the experimental work had been done by a Dutch clinician. The case was published, about a year ago, in the American Journal of Ophthalmology. (v. 1, p. 267). It was similar to Dr. Verhoeff's in histologic findings on the posterior surface of the cornea. There was secondary infection in the case, and the original eye could not be studied to find the original pathology of disciform keratitis; but the experimental work showed very much the same conditions.

Dr. E. V. L. Brown, Chicago: This may very well be on a neuropathic basis, but the picture here recalls the picture that we have in ring abscess, in which there is an equally characteristic zone of necrosis, which may be produced by the injection of organisms into any part of the anterior chamber. That is on a strictly bacteriologic basis; and altho this may be on a neuropathic basis, I do not see why we should assume it from the findings.

Dr. John E. Weeks: I want to ask Dr. Verhoeff if he would give to all reported cases the same classification? I should also like to ask whether the white dots that we see deep in the cornea in disciform keratitis were present in this case? I have seen many cases of herpes zoster with affections of the cornea, but I have never seen disciform keratitis associated with herpes zoster.

The neuropathic findings in many of these conditions cannot, it seems to me, obtain in those cases in which, by means of aseptic measures, the condition is corrected, or recovery takes place rapidly; as in certain cases, at least, of disciform keratitis. This was brought out in discussion, a year or so ago, when I presented a paper before the Ophthalmic Section of the American Medical Association.

Dr. Ryuzo Nodama, Tokaku, Japan, called attention to a paper he had written on experiments concerning the transmission of iodin into the aqueous chamber following the intravenous injection of potassium iodid, in which similar lesions were presented.

Dr. F. H. Verhoeff, Boston: In regard to Dr. Brown's suggestion as to an analogy between the condition I have described and ring abscess, I would say that there was not any in this case. In ring abscess the trouble is evidently due to toxins coming from behind; and as the term indicates, the condition is an abscess. The ring is due to a dense collection of pus cells, and it is evident that the toxins come from behind; because the injury is from behind, while in this condition the injury is in front. The tissues were destroyed in front. The toxins were not able to kill the cells; but they were working from the anterior layer of the cornea, and not from behind.

In regard to the cases that Dr. Nodama speaks of, I would say that I did not run across that. I should like to have seen it. I am interested to find that such conditions could be produced experimentally.

In connection with what Dr. Weeks said, I would state that in speaking of these different conditions of disciform opacity, I did not mean to imply that all these cases would come under what Fuchs calls disciform keratitis; but simply to indicate that they had the appearance, which makes it likely that the picture that Fuchs described could be subdivided still further.

In regard to herpes zoster, Fuchs noted that it is followed by keratitis profunda and disciformis. I have seen disciform keratitis follow herpes zoster.

Ophthalmic Zoster, Retrobulbar Neuritis, Acute Glaucoma.

Dr. Clarence A. Veasey, Spokane, Wash., reported two cases of herpes zoster ophthalmicus with unusual complications.

Case 1. A woman with right ophthalmic zoster, on the seventh day of the attack lost the vision of her right eye except a small part of the upper field. The blindness had spread from the center of the field, and the next day the whole field was abolished without ophthalmoscopic changes. The cornea was not involved. A month later the peripheral field was restored. V.= fingers at two feet. But the optic nerve was now pale and atrophic, and later all vision was lost.

Case 2. A man, aged 30, came with a history of an herpetic attack on the right forehead two weeks before. V. =R. 1/45, L. 6/5. The cornea was hazy, pupil dilated and immobile. Tension 35 mm. The tension became normal in a few days under pilocarpin, hot compresses and a purge; and the patient disappeared.

Discussion. Dr. Arnold Knapp, New York. The association of glaucoma and herpes is interesting, and leads to speculation as to the possible function of the ciliary ganglia. During the past winter, I observed a case that explained the condition as a variety of cyclitis. A woman of fifty-five years developed high tension after herpes zoster—a tension of between fifty and sixty. Under the use of pilocarpin, this tension was reduced; and the attack passed off. During the next six weeks, the eye was quiet; except that three definite corneal deposits could be discovered. That shows that this increased tension from herpes is merely cyclitis, due probably to the same toxic organism as the herpes. This patient, four to six months later, developed marginal ulcers of the cornea, for which a mydriatic was given. I had feared to do this, but did so without causing a return of the glaucomatous manifestations.

Dr. George E. de Schweinitz, Philadelphia: I have seen several cases of acute rise in intraocular tension associated with herpes zoster. I will refer to two of them, along the line of what Dr. Knapp has just described. In the first case, there was a curiously produced herpes zoster ophthalmicus, unassociated with any corneal lesion, and also a little conjunctivitis. On the third day after pronounced opalescence of the lens, there appeared a very pronounced rise of tension, and a rather deeper anterior chamber than one would have expected. This condition disappeared under the influence of miotics. Following this, there appeared a stage of slight ciliary flush. It was a very important case; and I spent anxious nights because I did not know whether to use a mydriatic or not. But finally, I did so without producing a rise of tension. The ultimate result was good; but, in association with what Dr. Veasey has said, curiously enough, there was a localized patch of atrophy of the optic nerve, with a corresponding defect of vision—altho the central vision is good. I do not know what could have produced it. Perhaps it may have been due to some alteration in the vascular supply, as in many cases of arteriosclerosis.

The second case is one of a more common kind. Following a small herpetic ulcer of the cornea, which yielded to ordinary treatment, the patient recovered entirely, with normal vision, normal fundus, and no ophthalmoscopic changes; but developed, some weeks later, a persistent rise in tension, which always yielded to miotics, but always reproduced itself on the cessation of their use. There never was any fault in the field of vision, and never any reduction of the central visual acuity, as long as the miotics were used; but prompt return of tension on their cessation. Ultimately (the case was one that I saw with a colleague) the patient was cured by iridectomy or some such procedure.

I think that Dr. Knapp has correctly stated the pathology of these cases of rise of tension, in that there may be an iridocyclitis, either with or without corneal complication.

Dr. F. H. Verhoeff, Boston: In connection with the ocular complications of herpes zoster, a patient I had about eight years ago, had a slight iridocyclitis and slight opacities in the vitreous. These cleared up, and I noted that she had a typical unilateral Argyll-Robertson pupil. She had a negative Wasser-

mann reaction, and no signs of tabes or other syphilitic disease. She has remained in perfect health ever since; but the Argyll-Robertson pupil persists unchanged. The pupil on the other side is absolutely normal in its reactions.

This case strongly supports the view that the Argyll-Robertson pupil is due to a lesion of the ciliary ganglion. As it is unilateral, it is almost impossible for it to be due to anything else. In herpes zoster, you sometimes get motor paralysis in other motor nerves; and, as an explanation of the process, it is easy to see how the ciliary ganglion could be attacked. I feel very strongly that the condition of the pupil is due to lesion of the ciliary ganglion.

Dr. Allen Greenwood, Boston: Speaking of glaucoma in herpes zoster ophthalmicus, it has been my custom to carefully try the tension in all these cases, because of past experience. I have had one case of bilateral herpes—the only case that I have seen in which an absolutely positive diagnosis of this condition was made. In that case, there was increased tension, in spite of all treatment; and the eye had to come to enucleation. In the other eye the tension was reduced with miotics. But for several years afterwards, the patient had repeated attacks of herpes of the cornea, with increased tension, relieved by miotics. Finally at eighty years of age, the patient lost the other eye, following an attack of herpes of the cornea that became infected. The eye sloughed and was destroyed.

Dr. C. F. Clark, Columbus: The points that Dr. de Schweinitz brought out are extremely important from the practical point of view. I have now under treatment a man who had a typical case of herpes zoster, in which we found a positive Wassermann. He had been under treatment for weeks and months for glaucoma. The herpes was recognized, and he had increased tension. He was under the active use of eserin by his oculist, and his case was going to the bad. He had iridocyclitis in connection with the glaucoma. I judged it was well to try a mydriatic in place of the miotic. The specific condition underlying it required treatment also. He had relief immediately, when put under full mydriasis, and cycloplegia.

The important question in therapeutics here is, how we shall determine, as quickly as possible, when to discontinue miotics in cases of what you might call symptomatic glaucoma. I am coming to the conclusion that a very large number of cases of increased tension are to be traced to the localized or immediate effect of the difficulties in the filtration angle, but are not at all true glaucoma, which will resent the use of atropin. In other words, I think that when glaucomatous symptoms arise in the course of other diseases of the eye these may be treated immediately with impunity by means of a mydriatic or cycloplegic, if we can assure ourselves that we are not dealing with a true case of idiopathic glaucoma.

Dr. Robert S. Lamb, Washington: I have noted, in connection with increased intraocular tension, not only with herpes, but also with some other conditions of allied character, that there is a suggestion of what I have called a funnel-iris. The appearance of depth in the anterior chamber seems to be associated with a narrowing down; and the iris seems to recede towards the pupillary margin. In these cases, I have found invariably that I can use a mydriatic without damage. I think they are probably due to an iridocyclitis.

Dr. W. R. Parker, Detroit: I wish to place on record glaucoma occurring in a case of herpes of the brow and side of the face, in which there was a decided increase in tension. The tension was not determined by the tonometer, but estimated by the fingers merely; but it must have been about plus two or three. There was no question of the increase in tension, with the other symptoms that go with it. I persisted in the use of eserin, and was not a little worried about the course that the case was taking. It was only after the tension had been reduced, altho not quite to normal, that I ventured to put in atropin. Within a comparatively short time after this had been done, the tension began to return to normal; and it remained normal. There was in this case, also, distinct

evidence of low-grade iridocyclitis. The relation of the two, at the time, did not occur to me. I think that it would have been better in this case if the atropin had been used earlier.

Dr. Hiram Woods, Baltimore: In a recent number of the American Journal of Ophthalmology, someone made a distinction between symptomatic hypertension and glaucoma. It seems to be confirmed by the observations that have been made. I want to add one more.

I had a case that bothered the life out of me while it lasted, in a lady with a definite herpes zoster ophthalmicus, who, after a few days, developed pretty typical symptoms of iridocyclitis. The tension was 35 to 38—just enough up to alarm me. As soon as the miotic was used, one-tenth of a grain of eserin and of pilocarpin to the ounce, her pain was increased. I began with a weak solution of homatropin; and under atropin, taking the tension carefully as the stronger mydriatic was used, the tension gradually came down. It was evidently a case of secondary iridocyclitis.

This introduces an important subject, when does atropin do good, in spite of apparent hypertension? There are cases of that kind. This woman, in the course of her eye trouble, developed suddenly a flare up of an old chronic appendix. Dr. Finney was called in and operated. Within four days, her eyes cleared up, and have remained normal ever since.

Dr. John E. Weeks, New York City: Inflammation or irritation of the iris produces a change in the character of the aqueous humor, whether following operation or following disease; and in certain cases this change in the aqueous includes elements that will not pass readily thru Fontana's space. In those cases, we are apt to get the result of tension. We all know, also, that in herpes zoster ophthalmicus, the iris is affected; and in some cases, the ciliary body, whenever the cornea is affected; and it is possible that the iris and the ciliary body may be affected when the cornea is not affected. Consequently, a rise in tension in these cases is easily explained on this hypothesis. The change in the aqueous has been definitely proved.

The use of miotics or of mydriatics in these cases may be resorted to in a tentative way. I have frequently seen that a mydriatic in these cases would produce a more beneficial effect than a miotic; but the reverse is also true. In certain of these cases, the patient must come to operation; because probably, in addition to this interference on the part of the changed aqueous humor, there is a condition that tends to keep up the intraocular tension. There were two cases that came to operation in my service. One case was referred to me by Dr. Cutler, who observed it for some time before asking me to take charge of it. Altho in many cases we may greatly relieve the condition by the use of miotics or mydriatics, in a certain small percentage operation must be undertaken.

Dr. Lee M. Francis, Buffalo: On this question of the use of miotics with cycloplegics in increasing tension, it seems to me that we are forgetting, for the moment, at least, the information that the corneal loupe can give us. If there is a deposit in Descemet's membrane, it seems to me that this instrument will decide whether or not we can use atropin. In the presence of a deposit on this membrane, even tho only one or two spots, the use of a cycloplegic is clearly indicated.

(To be continued.)

ABSTRACTS

René Onfray. Retinitis in Diabetes.
[Ann. d'Ocul., v. 155, p. 533.]

The author discusses this in an article of 37 pages, containing a table epitomizing 24 cases. There are, also, three figures showing graphically (1) the relation between arterial tension and diabetic retinitis, (2) the relation between uremia and diabetic retinitis, and, (3) the relation between the "constant" of urea secretion and diabetic retinitis.

He discusses the subject under three heads. (1). Arterial Tension and Diabetic Retinitis. Hemorrhages are found either as discrete, punctiform lesions or as red areas; or as profuse hemorrhages invading the vitreous and even culminating in glaucoma or detachment of the retina. This symptom would indicate a hypertension. In some patients, appropriate diet reduced the tension, but in others it was only partly reduced, or even increased further.

(2). Renal Function and Diabetic Retinitis. Ten patients had albuminuria, 4 of whom had about 1 gm. to the liter, but the amount varied. There was hyperviscosity in 2 cases, blood in 9 cases, normal in 4, and hypoviscosity in 2 cases. As a rule the hypertension and hyperviscosity were associated. Edema was found in only two cases. Uremia. In 20 cases examined the amount of urea in a liter of blood serum was, 10 cases, less than 0.5 gm.; 4, between 0.5 and 0.7; 3, between 0.7 and 0.9; 3, one gram or over. The initial urea-secretory constant, determined according to Ambard's method, is a fairly good prognostic method, most of the cases with good or medium constant surviving the retinitis for a long time; at least one case lived 7 years after the retinitis appeared.

(3). Clinical Character of Diabetes Complicated by Retinitis. Since diabetes exists often for a long time without being suspected, it is impossible to say at what stage of the disease the retinitis appears. But in 22 cases, the interval between the recognition of the glycosuria and the retinitis varied from 0 to 28 years, the majority being from 3 to 9 years.

No conclusion could be drawn as to the relation of malnutrition and retinitis as most of the author's cases were not accompanied by loss of weight. The presence of the diabetes indicates nothing as to acidosis, since most of the patients lived a long time after the retinitis appeared. Aside from the fairly constant association of diabetes with hypertension and with nephritis, one case developed in a gouty patient and two followed trauma. In regard to the vital prognosis, only 7 cases have been followed since 1911, of whom 3 died in 2 years and 4 still survive.

As to the pathogenic problems of diabetic retinitis, the hemorrhages are due either to the state of the blood vessels, or transient hypertension or condition of the blood. The white areas are objectively of three kinds: (a) preretinal cicatricial bridges, resulting from a cicatricial sclerosis of the peripheral layers of the vitreous, (b) polycyclic plaques, due probably to unabsorbed serous products, altered by toxic changes in the blood, (c) brilliant white spots, either isolated or in plaques, probably due to fatty deposits.

Retinal lesions of diabetics bear upon general therapy thus: (a) For diabetes without hypertension or renal insufficiency, give only as much carbohydrates as the patient can assimilate, considering the amount of nourishment furnished by the proteids and fats. Small amounts of fluids are to be taken at a time. The appearance of retinitis indicates an alimentation reduction cure. (b) For diabetes with hypertension, to the above should be added treatment directed against the hypertension. (c) In diabetes with uremia two contradictory treatments are indicated, a hypernitrogenous for the diabetes, and a hyponitrogenous for the nephritis. The greatest care is necessary in these cases in regulating the diet.

C. L.

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THE ARMY OPHTHALMIC SURGEON

This caption is in truth a bit misleading, for tho the commissioned medical officers in charge of, or working in ophthalmology are denominated surgeons, the opportunity for purely surgical work in proportion to the cases encountered has been much more limited than in other branches of surgical practice.

In the beginning his rôle was eminently that of a diagnostician, for the elimination of the unfit from the vast army of four million men. In this capacity his opportunities were indeed great for the examination of many rare chronic diseases and congenital defects. Often these were of such a character, happening, as they did, in the young, active and presumably healthy men, that the subjects themselves were unaware of their defects, and superficial examinations, even such as would be ordinarily conducted by a general physician, would not reveal the disability or disease.

Later, the exigencies of the work to which embryonic soldiers were put brought out symptoms such as weak vision and asthenopia, for which they applied for treatment. Here, too, the army oculist came into a great work as a diagnostician. Here may be especially noted the existence of a comparatively large number of cases of retinitis pigmentosa, of unexpected fundus lesions diagnostic of syphilis and tuberculosis, rare forms and bizarre types of congenital anomalies;—some of them great rarities in private practice.

It is as consultant that the oculist is of prime importance in actual medical work in the army hospital. Certainly, aside from cases directly diagnosed and referred by him in routine work, the diagnosis of syphilis, renal disease, diabetes, the nervous and the so-called rheumatic diseases, and some forms of chronic infections, has proven of great value. To fill such a position as it should be filled necessitates a wide knowledge of general medicine and surgical diseases.

As sanitary inspector and engineer, the ophthalmologist has seen to the lighting, the care of the eyes, and the prophylaxis when called upon to do so.

As statistician he has learned how to keep proper case records and to make succinct reports. In this office the chiefs of the divisional units particularly have become experts with the fountain pen.

As in private practice, a very large portion of the routine work for the ophthalmic staff has been the measurement of refraction and the prescription of glasses;—for soldiers who had never worn glasses developed eye strain by reason of specific work in the army. Then, too, the officers and members of their families have largely taken advantage of the free service and special talent, the latter of which was not obtainable in the Regular Army.

It is as operating surgeon that the army oculist has been put into the background, especially in the cantonments and hospitals of America. For we have had young men as patients, selected after more or less rigid physical examinations, whose surgical eye affections are largely limited to trauma, pterygia, hordeola and occasionally strabismus.

Battle injuries to the eyes have received their first dressings abroad, and in some cases plastic operations have been performed before returning to America. Still at each large hospital and cantonment a certain number of such cases have filtered thru, giving chances for observation and for such work, particularly secondary operations, as after an eyeball has been removed for injury. For instance, we have had six such cases at Camp Lewis, American Lake, Washington—truly a small number and only to be compared with a one-man surgical practice.

As only a moiety of soldier patients are old enough to have developed cataract, glaucoma or other diseases of elderly people, this class of operations has been conspicuous by its absence.

All of this is in contrast to the work of the Ear, Nose and Throat sections, for the diseases incident to these parts of the head are those of young people. Hence the vast number of tonsillectomies, of sinus cases, of deformities of the nasal septum and of mastoid operations that have been seen in this part of our practice.

On the whole, the oculist of the army has been the eyes of the medical service, and this is his chief function. Certainly he has himself greatly benefited by this training, by a widening of his medical views and by his association not only with the medical officers but with those of the line and with the personnel,—all of which will be of great value on his return to civil practice. —H. V. W.

SOME QUESTIONS OF PRIORITY IN THE LITERATURE OF SYMPATHETIC OPHTHALMIA

An interesting misconception as to the date of Mackenzie's most important publication has been handed down from father to son after the familiar manner of bibliographers. The date of Mackenzie's first description of sympathetic ophthalmia, as given by de Wecker in the first edition of Graefe-Saemisch, and by Randolph in Norris' and Oliver's system, is 1844. This, however, is merely the date of the first French translation of the third London edition. Schirmer, in his monograph in the second edition of the Graefe-Saemisch Handbuch, erroneously gives the date of the third edition as 1839; and further errs in stating that the classic description first appeared in the edition of 1835. Even the mighty Hirschberg falls for this tradition, and refers to the date as 1844, "or better, 1835."

The fact is that Mackenzie's first edition of 1830, under the head of "Traumatic Ophthalmiae," p. 30, says: "We sometimes meet with severe sympathetic inflammation in the eye which has not received the injury." This is all in this edition. In the edition of 1835, p. 560, he says: "We sometimes meet with severe sympathetic inflammation in the eye which has not received the injury, especially in subjects of scrofulous constitution. For instance, a patient applied at the Glasgow Eye In-

firmary with severe iritis in the right eye, brought on in consequence of an accidental and destructive laceration of the left." This is also under the heading "Traumatic Ophthalmiae," and is all that this edition contains on the subject. In the edition of 1840, for which Mackenzie wrote the preface in October, 1839, there first appears, pp. 523 to 534, the name "Sympathetic Ophthalmia," followed by the classic account of the disease which is so commonly quoted.

The edition of 1854, which I have seen in the American copy only, contains only a few changes, most of them unimportant and some of them for the worse. An example of the last is the change of title from Sympathetic Ophthalmia to "Reflex or Sympathetic Iritis." This is also true of the description of the mode of transmission, which Mackenzie made evidently under the increasing tendency to ascribe phlogogenic powers to reflex nervous impulses. In the 1840 edition he says: "It is extremely probable that the retina of the injured eye is in a state of inflammation, which is propagated along the corresponding optic nerve to the chiasma, and that thence *the inflammatory action* is reflected to the retina of the opposite eye, along its optic nerve. In the 1854 edition, the sentence is the same up to the word "chiasma"; the remainder being, "and that thence *the irritation which gives rise to inflammation* is reflected to the retina of the opposite eye, along its optic nerve." (Italics mine.)

From the standpoint of priority, the description given by Lawrence has not received sufficient attention. In his treatise on Diseases of the Eye, London, 1833, he gives four tolerably typical cases of sympathetic ophthalmia and says (p. 117): "When an eye has been lost by accident, the other often becomes diseased sooner or later, without any imprudence, or any external influence that would be injurious under ordinary circumstances. This kind of occurrence is so common that it is necessary to warn those who have lost an eye of their danger and to point out the necessary precautions for avoiding it. For this affection of the sound eye, if it is not noticed and properly treated in the early stage, often destroys sight. Its most common form is slow inflammation which may effect [*sic*] the iris, the retina or the internal tunics generally." This, with the case reports, is so far ahead of anything that had appeared up to the appearance of Mackenzie's third edition, that Lawrence easily takes second place among the pioneer students of sympathetic ophthalmia.

H. G.

CREDIT WHERE DUE

It should have been mentioned in our July number, in connection with the valuable paper of Lieut.-Col. Derby on the control of trachoma, that the illustrations that added materially to the clearness and interest of the article were based on photographs given to its author by Col. W. T. Lister, ophthalmic consultant of the British Expeditionary Forces. They actually represent British trachoma work in France, a knowledge of which became the basis of the effective work of Col. Derby and his colleagues in connection with the American Expeditionary Forces, when they had to face the same problems.

In this connection we wish to call attention not only to the extremely cordial relations that existed between British and American Ophthalmologists attached to the Expeditionary Forces; but also to the interest in and desire to render every assistance to the American Journal of Ophthalmology by ophthalmologists in every part of the British Empire. We hope that our readers everywhere will recognize the solid practical worth of the original articles appearing in the British Journal of Ophthalmology; and appreciate the splendid fight that is being made to sustain such an ophthalmic journal under the extremely difficult conditions now existing.

THE HIGH COST OF PUBLISHING

We have before alluded to the difficulties that now beset the publication of a high-class scientific journal. Recently one of the foremost American weeklies came out shorn of its advertising pages and much of its usual reading matter—less than one-quarter of its usual size—because of a "dispute between two factions of a labor union in the printing establishment which prints the magazine." Certain prominent publishing houses have proposed the suspension for several months of a large number of publications as the only way to bring about more stable and reasonable conditions.

Our last unpleasant surprise in this direction was an increase of 15 per cent in the cost of printing this journal, estimated on and added to the preceding similar increases, which became effective when notice of it was received last month. We have endeavored not to allow these difficulties to impair the quality or limit the size of this journal. If only the new year will show an increase of 15 per cent in the number of our subscribers, our success in meeting the high cost of publishing is assured.

Such an increase in our subscription list would only represent 10 per cent of the American ophthalmologists who need this journal but do not now subscribe for any journal published with regard to their specialty. It can be easily brought about by active propaganda on the part of our subscribers among acquaintances who do not take an ophthalmic journal. It is a rare opportunity to do missionary work in the profession, and at the same time improve the journal that you get each month.

BOOK NOTICES.

The Ophthalmoscope, A Manual for Students, by Gustavus Hartridge, F. R. C. S., London, Sixth Edition. 12mo, 160 pages, with 65 illustrations and four plates. Philadelphia, P. Blakiston's Son & Co.

A new edition of this work twenty-eight years after its first publication calls attention to the fact that no work of the kind has appeared in that time to supplant it. It gives a comparatively brief but clear account of its subject, is well illustrated, includes a good explanation of the anatomic significance of the appearances revealed by the ophthalmoscope and urges a good practical routine for using the instrument.

Two of the plates printed in fundus colors will be quite helpful to the student. The value of the other two is more open to question. It is rather surprising to find at this day no mention of the electric ophthalmoscope; and for a book to be read by American students, some account of the Loring ophthalmoscope would be more helpful than details regarding the Morton instrument, or that of Parent with cylindrical lenses. The latter was a novelty of some importance when the first edition was published, but is now of only historical interest.

The book is neatly printed and bound in a form to be readily carried in the pocket.

E. J.

BIOGRAPHIC SKETCHES

T. H. Shastid, M. D.

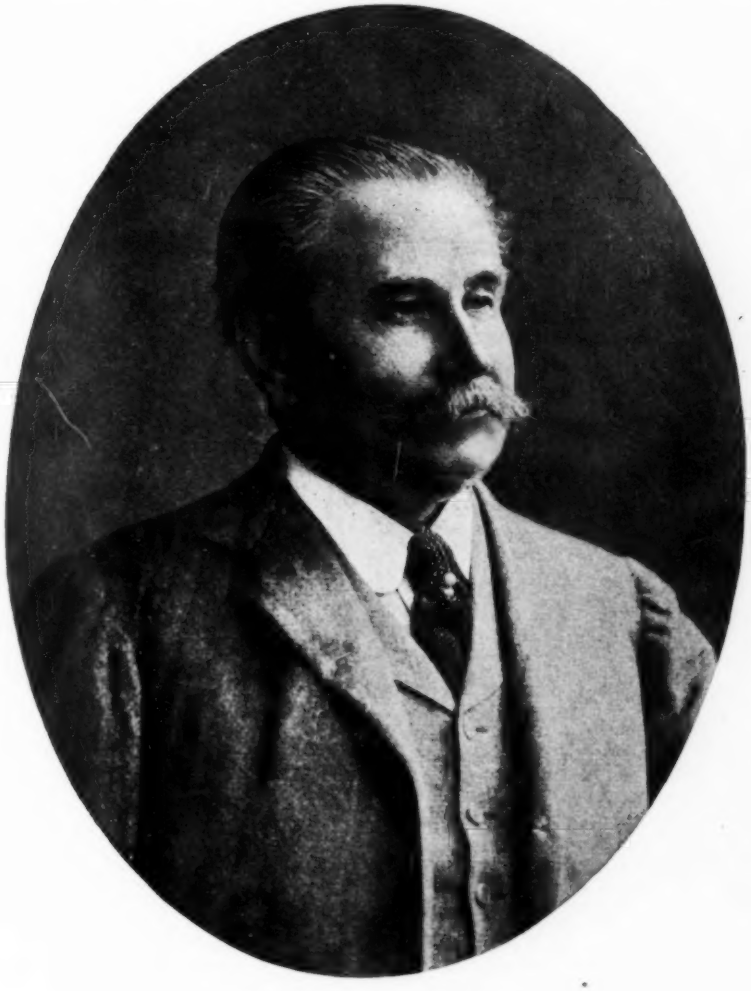
Superior, Wisconsin

Sir James Mackenzie Davidson, the English ophthalmologist, inventor of the cross-thread method of localizing foreign bodies by means of the X-rays, and the foremost radiologist of the United Kingdom, was born Dec. 6, 1856, at Estancia, Santo Domingo, Buenos Aires, son of John and Margaret Davidson. He received a liberal education at the Scotch School in that city. His medical training was had at Edinburgh, Aberdeen and London. His degrees in medicine and surgery (M. B. and C. M.) were received at Aberdeen in 1882.

For a time he was assistant in surgery at Aberdeen, but in 1886 succeeded Prof. Dyce Davidson as ophthalmic surgeon at the Aberdeen Royal Infirmary. This position he held till 1895. He was also ophthalmic surgeon to the Royal Infirmary and the

Royal Sick Children's Hospital, Physician to the Blind Asylum, etc.

In 1897 he removed to London, and from that time on devoted exclusive attention to the X-rays. He had, in fact, already, in 1896—the year after the rays were discovered—gone to Würzburg there to talk with Roentgen about his new discovery. In the July, 1897, number of the "Archives of the Roentgen Ray," he published a cut of a bladder stone radiograph, and from that time forward was one of the foremost workers in the world on the subject of radiography. He became consulting surgeon to the X-ray Department, Charing Cross Hospital; consulting surgeon in charge of X-ray Department, Moorfields; president of the Roentgen Society; president of the Radiology Section of the 17th International Medical Congress, 1913; a Fellow of the Physical Society, etc. For the last three years of the war, he was consulting radiologist to the military hospitals of the London district. He was knighted in 1912.



Sir James Mackenzie Davidson
1856-1919

Among his more important publications may be mentioned: "The Electric Light Applied to the Ophthalmo-

scope," Lancet, 1886; "Localization of Foreign Bodies in Eyeball and Orbit," Trans. IX Internat. Oph. Congress, Utrecht. Many of his articles appear in the Transactions of the Ophthalmological Society of the United Kingdom.

Sir James was a man of medium height and weight, with bright blue eyes, blonde mustache and hair and a very deliberate, courteous, kindly manner. All his associates were very devoted to him. He was a member of the Church of England.

In 1886 he married Georgiana, daughter of William Henderson, of Aberdeen. His abode was at 26 Park Crescent, Portland Place, W., London, where he died in April, 1919. A memorial service was held on April 7 at All Souls Church, Langham Place. The doctor is survived by Lady Davidson, a son, Mr. Colin Davidson, who is Mr. Bonar Law's private secretary, and a daughter, the wife of Dr. Bernard Potter of London.

LEONARD GEORGE GUTHRIE. This well known London neurologist and pediatrist, who was for a time physician to the Western Ophthalmic Hospital, was born Feb. 7, 1858, the second son of Thos. Anstey, and Augusta Guthrie of Kensington. His education was received at King's College School, Magdalen College, Oxford, and St. Bartholomew Hospital, London. He was always deeply interested in ophthalmology, and was a close student of the ocular relations of neurology and pediatrics. He died on December 24, 1918, from injuries received in an accident on the previous day. He was a brother to Anstey Guthrie, author of "Vice Versa," "The Giant's Robe," etc., whose pen name is F. Anstey.

CHARLES H. PIXLEY, an optical expert, long with F. A. Hardy and Co., Chicago, was born in Millford, Michigan, Sept. 16, 1844. He invented and perfected the Hardy ophthalmometer, and other instruments, and wrote on optical subjects for the Hardy Messenger. For the last three years he had been an invalid, and died June 1, 1919.

ANDREW J. STEWART, was born at Provo City, Utah, April 10, 1873, the oldest son of Andrew J., and Melissa Riggs, Stewart. For a time he was government surveyor, then school teacher, and, at length, a missionary to Germany from the Church of Jesus Christ of Latter-Day Saints. He graduated from the business department of Brigham Young University in 1895, and, in 1900, from the normal department. Entering the College of Physicians and Surgeons at Baltimore, he there received his medical degree in 1904. He married Miss Rose Young of Provo City. For a time he practiced at Mt. Pleasant, Utah, but later removed to Provo, and paid especial attention to diseases of the eye, ear, nose and throat. He practiced there until his death, May 25th, 1919, of bronchopneumonia. At the time of his death he was president of the Utah County Medical Association.

NEWS ITEMS

Personals and items of interest should be sent to Dr. Melville Black, 424 Metropolitan Building, Denver, Colorado. They should be sent in by the 25th of the month. The following gentlemen have consented to supply the news from their respective sections: Dr. Edmond E. Blaauw, Buffalo; Dr. H. Alexander Brown, San Francisco; Dr. V. A. Chapman, Milwaukee; Dr. Robert Fagin, Memphis; Dr. M. Feingold, New Orleans; Dr. Wm. F. Hardy, St. Louis; Dr. Geo. F. Keiper, LaFayette, Indiana; Dr. Geo. H. Kress, Los Angeles; Dr. W. H. Lowell, Boston; Dr. Pacheco Luna, Guatemala City, Central America; Dr. Wm. R. Murray, Minneapolis; Dr. G. Oram Ring, Philadelphia; Dr. Chas. P. Small, Chicago; Dr. John E. Virden, New York City; Dr. John O. McReynolds, Dallas, Texas; Dr. Edward F. Parker, Charleston, S. C. Volunteers are needed in other localities.

DEATHS

Dr. Benjamin F. Church, Redlands, California, died in Los Angeles, September 2nd, at the age of 61.

Dr. Charles C. Kimball, Watertown, N. Y., died at his home, August 16th, from nephritis, aged 57.

Dr. Hatton I. Jessup, Philadelphia, aged 57, died at his home from pyelonephritis, September 3rd.

Dr. Francis R. Musser, Oakland, California, died August 26th, aged 59.

Dr. A. P. Van Schevensteen, of Anvers, Belgium, died April 21, 1919, aged 71.

PERSONALS

Dr. L. M. Hurd, of New York City, announces the removal of his office to 39 East 50th Street.

Dr. A. P. Knapp, of Vincennes, Indiana, has disposed of his eye and ear hospital.

Dr. William Zentmayer, of Philadelphia, returned on August 15th after six weeks at Lake Minnewaska, N. Y.

Dr. William Campbell Posey has returned to Philadelphia after a summer spent at Watch Hill, R. I.

Dr. L. Webster Fox, of Philadelphia, has returned after a six weeks' sojourn at Estes Park, Colorado.

Dr. W. B. Lancaster, of Boston, has been spending a few weeks in San Francisco and Palo Alto.

Dr. Charles A. Pfafflin, of Indianapolis, has returned from a month's stay at the Mayo Clinic, Rochester, Minn.

Dr. A. E. Bulson, has returned from a month's outing in the mountains of Montana.

Failing to comply with the Illinois state law requirements in reporting a case of sore eyes in a baby, is said to have resulted in Dr. Frank J. Zuehlke being fined twenty-five dollars and costs.

Dr. Nelson M. Black, late Senior Consultant in Ophthalmology, A. E. F., France, announces his return to civil practice in Milwaukee, continuing his partnership with Dr. Vernon A. Chapman.

The author of the Homer Smith operation for cataract has removed his offices from Norwich, N. Y. to 276 Madison Ave., New York City. Dr. Smith has been appointed Assistant Surgeon to the Knapp Memorial Hospital.

Dr. Adolph Barkan will relate his recent experiences in Europe to the Eye, Ear, Nose and Throat Section of the San Francisco County Medical Society, on September 23rd.

Dr. H. W. Eby, of Goshen, Ill., will be assisted in the practice of Ophthalmology by his sister, Miss Ida L. Eby, recently graduated from the College of Medicine and Surgery of the University of Illinois.

Dr. Charles B. Goulden has been appointed Ophthalmic Surgeon to the Victoria Hospital for Children at Chelsea, England; and M. L. Hines Opthalmic Surgeon to the Miller General Hospital, at Greenwich.

Dr. H. A. Brown, has been appointed Clinical Instructor, and Dr. W. H. Dudley, Assistant in Ophthalmic Surgery, at Stanford University Medical School.

The estate of the late Dr. Frank C. Todd, who died about a year ago while in service, amounted to $419,171.00; inheritance tax $10,-351.00.

Dr. S. Lewis Ziegler, of Philadelphia, has recently returned from Europe where he presented a communication on Artificial Pupil before the Oxford Ophthalmological Congress. He also visited the Queen's Hospital at Sidcup near London, where so much plastic surgery of the face has been performed by Major Gillies and others. In Paris he found the work of Poulard in ocular plastics and Lemaitre in nasal plastics very original and interesting.

Dr. George W. Jean, of New York City, has located at 1231 State Street, Santa Barbara, California. At the time Dr. Jean left New York City he held the position of Senior Assistant Surgeon in the eye department at the New York Eye and Ear Infirmary, with which institution he had been connected since 1909. He also was Attending Ophthalmologist to the medical department of New York University and a member of the New York Ophthalmological Society, etc.

MILITARY NOTES

A movement has been initiated by the committee of men blinded in battle to duplicate in Italy the reeducation of blinded soldiers now being carried on in France.

S. L. Thorpe, Capt., M. C., U. S. A., for the past year surgeon in charge of the Eye, Ear Nose and Throat department, Department Hospital, Manila, P. I., has been discharged from the service and has resumed practice at Clinton, Illinois.

The following have returned from Army service and resumed practice: Dr. Thomas H. Curtin, of New York (A. E. F.); Dr. August L. Beck, New Rochelle, N. Y., (A. E. F.); Dr. Ernest F. King, New York; Dr. H. V. Hubbard, Plainfield, New Jersey.

The Federal Board of Vocational Education will open a school at Vincennes, Indiana, to educate disabled soldiers in optometry and lens grinding. The municipal government will furnish classrooms while Vincennes will coöperate in instructing the pupils in mathematics and English. Only students with the equivalent of seven years' schooling will be admitted.

The Manhattan Eye, Ear and Throat Hospital has arranged a course of nine months beginning October first.

The Braille Music Club, composed of one hundred blind singers and musicians, gave a concert recently in Chicago.

A post of the American Legion composed of blinded members of the Army, Navy, and Marine Corps, has been formed with headquarters at Baltimore, and branches in other cities.

MISCELLANEOUS

The San Francisco Polyclinic and Post Graduate College will resume instruction in all the special branches of medicine and surgery on October 15th. This institution was closed as a teaching institution during the war.

According to a report issued by the American Red Cross, the abnormal number of Polish children born blind during the last three years in spite of healthy parentage, is due mainly to the malnutrition of mothers.

The Ophthalmic Seminar at the New York Post-Graduate College has attracted so many men during the last year that the course was continued during the summer months with a class of thirteen matriculates.

The Ohio State Department of Health has opened a campaign to rid Ohio of trachoma, which is especially prevalent in the counties bordering the Ohio River where the disease is believed to have spread from the mountain districts of Kentucky and West Virginia. An intensive campaign is to begin at once in Scioto County.

The Bulletin of the Belgian Ophthalmological Society is to appear twice a year; a number just issued being the first since 1914. It contains addresses by Dr. Van Duyse and a reply by Dr. Coppez, and mentions the names of members who have been taken from their midst since their last meeting: Homere C. Callaert, of the University of Gande, a victim of influenza in 1915, Rafael van Oye, in 1917, and F. Lacompte, of Gande, who died in 1918.

The Ministry of Health, London, announce that they have, after consultation with the Advisory Committee of the Welfare of the Blind, issued regulations under which, subject to the consent of Parliament, grants will be paid in aid of certain services carried on in behalf of the blind. These services include workshops, assistance to home workers, home teaching, homes and hostels, book production.

The Committee on Health and Sanitation of the Pennsylvania State Legislature has reported the amendment to the existing optometry law, so as to require a majority of the State Optometry Board of seven members to be physicians, licensed under the laws of the state and qualified to practice medicine and surgery, and that the other members of Board shall be optometrists.

At a recent conference in Leeds, England, of representatives of local authorities and other persons interested in the welfare of the blind in the North-East Division of the West Riding of Yorkshire Mr. William Harvey, who presided, estimated that there was a blind population in the district of 465, of which the majority was to be found in the Leeds area where workshops had been long carried on, and a complete system of visitation existed. The Leeds Education Committee had provided facilities for educating the blind in special schools. It was proposed to form a district committee consisting of one representative each from the West Riding Education Committee, the Leeds Education Committee, the Yorkshire Vagrancy Committee, and the several boards of guardians in the district, the Leeds Institution for the Blind and Deaf and Dumb, and the Leeds Branch of the National League of the Blind. On the proposal of a blind delegate present, it was agreed that blind people should comprise one-third of the membership of the committee. A resolution was passed urging the Government to expedite the payment of grants towards the care of the blind.

OPHTHALMIC LITERATURE

These lists contain the titles of all papers bearing on Ophthalmology received within the preceeding month. These titles are all in English, some of them modified to indicate more clearly their subjects. These subjects are grouped under appropriate heads, the succession of groups being the same from month to month. In the group the papers are arranged alphabetically usually by the name of the author in heavy-face type. After the subject of the paper (Ill.) indicates the number of illustrations. (Pl.) the number of plates, and (Col. pl.) colored plates illustrating the article. (Abst.) shows that it is an abstract of the original article. (Bibl.) tells that the paper is accompanied by an important bibliography. (Dis.) means that a discussion of the subject is published with it. Under Repeated Titles are indicated additional publication of papers already noticed. To secure the earliest possible notice writers may send copies of their papers, or reprints, to 518 Majestic Bldg., Denver, Colorado.

DIAGNOSIS.

Howard, H. J. Test for Judgment of Distance. Amer. Jour. Ophth., v. 2, pp. 656-671.

Koeppe. The Nernst Lamp. Zeitschr. f. Augenh., v. 40, p. 349.

Landolt, M. Mathematic Precision of Test-Types. (1 ill.) Arch. de Oft. Hisp.-Amer., v. 19, pp. 447-450.

Luckiesh, M. The Visibility of Air Planes. Jour. Franklin Inst., v. 187, p. 409.

Stargardt, K. Radium Emanation Rays for Adaptometer. Zeitschr. f. Augenh., v. 40, pp. 228-232.

THERAPEUTICS.

Arens. Ocular Therapy. Woch. f. Therap. u. Hyg. des Auges. v. 22, pp. 105-106.

Decker, L. Arthigon Therapy in Disease of Eye. Inaug. Diss., Jena, 1919.

Kauffmann, F. Ophthalmic Therapy in the War. Woch. f. Therap. u. Hyg. des Auges., v. 22, pp. 145-147.

Sollmann, T. Benzyl Alcohol: Efficiency as Anesthetic for Rabbit's Cornea. Jour. Pharmacol. and Exp. Therapeutics, v. 13, pp. 354-356.

Wetterer-Mannheim. Powdered Ointment. Dermat. Woch., 1919, No. 19. Abst., Woch. f. Therap. u. Hyg. des Auges., v. 22, pp. 147-148.

OPERATIONS.

Landolt, M. Site for Optical Iridectomy. (1 ill.) Arch. de Oft. Hisp.-Amer., v. 19, pp. 451-454.

Meller, J. Augenärzliche Eingriffe. (801 ill.) Wien. u. Leipzig. Josef Safar, 1918. 428 pp. 8vo.

REFRACTION.

Beckers, H. Cause of Myopia. Berl. klin. Woch., 1919, 8. Abst., Woch. f. Therap. u. Hyg. d. Auges., v. 22, p. 151.

Blegvad. Progression of Myopia. Woch. f. Therap. u. Hyg. des Auges., v. 22, p. 142.

Daly, R. R. Progressive Abnormalities of Refraction. Southern Med. Jour., v. 12, pp. 503-506.

Ginestous, E. Paralysis of Accommodation, cured by Antidiphtheric Serum. Jour. de Med. de Bordeaux, v. 48, p. 234.

Gonzalez, Jose de J. Refraction in Keratoconus. Amer. Jour. Ophth., v. 2, p. 606.

Gould, G. M. Overlooked Causes of Failure to Cure Systemic Diseases by Spectacles. Amer. Med., v. 14, pp. 539-541.

Hall, R. H. B. Eyestrain in the Submarine Service. Jour. Roy. Nav. Med. Service, London, 1919, pp. 180-183.

Harbridge, D. F. Refraction in Relation to the Conservation of Vision. Southwestern Med., v. 2, pp. 1-5.

Nordenson, J. W. Changes in Lens with Accommodation. Skandin. Arch. f. Physiol., 1918, v. 35, p. 101.

Ochi, S. Relation of Ocular Muscles and Sclera in Etiology of Myopia. Amer. Jour. Ophth., v. 2, pp. 672-676.

Raefler, J. Correction of Myopia with Telescopic Glasses and Loupes. Inaug. Diss., Jena, 1919.

Smith, H. A. America's Optical Emancipation. Scient. Amer., 120, p. 454.

Wilson, J. A. Myopia. Brit. Jour. Ophth., v. 3, p. 430.

Wolff, H. Group Experiments with the Rohr Telescopic Glasses. (2 ill.) Zeitschr. f. Augenh., v. 40, pp. 235-253.

Repeated Titles. **Landolt.** (v. 1, p. 219) Brit. Jour. Ophth., v. 3, p. 370. **Menacho** (v. 2, p. 627) Clin. Opht., v. 23, p. 429.

OCULAR MOVEMENTS.

Benjamins, C. E. Tonic Reflexes of the Ocular Muscles. Arch. Neerl. physiol., v. 2, p. 536. Abst., Zentralbl. f. Physiol., v. 33, p. 402.

Huizinga, J. G. Method of Suturing in Advancement Operation for Strabismus. Amer. Jour. Ophth., v. 2, p. 606.

Maxwell, E. M. Concomitant Squint in the Practice of the Late Mr. P. W. Maxwell. (4 ill., Bibl.) Brit. Jour. Ophth., v. 3, pp. 408-420.

Ohm. Miners' Nystagmus. Graefe's Arch. f. Ophth., v. 98, No. 1. Abst., Woch. f. Therap. u. Hyg. des Auges., v. 22, No. 28-29, p. 128.

Pichler, A. Brief Bilateral Abducens Paralysis after Influenza. Zeitschr. f. Augenh., v. 40, p. 334-337.

Tracy, E. A. Recording Conjugate Deviation Test. Boston Med. and Surg. Jour., Sept. 4, 1919, p. 299.

Valk, F. Strabismus. Amer. Jour. Ophth., v. 2, pp. 603-605.

Zentmayer. Ocular Motor Palsies as a Sequel to Influenza. (Dis.) Amer. Jour. Ophth., v. 2, p. 611.

Repeated Titles. **Castresana.** (v. 2, p. 627) Jour. Amer. Med. Assn., v. 73, p. 461. **Heine.** (v. 2, p. 306) Clin. Opht., v. 23, p. 434. **Pichler.** (v. 2, p. 628) Woch. f. Therap. u. Hyg. des Auges, v. 22, p. 107. **Sauvineau, C.** (v. 2, p. 628) Clin. Opht., v. 23, p. 379. New York Med. Jour., Sept. 6, p. 431. Jour. Amer. Med. Assn., v. 73, p. 369.

CONJUNCTIVA.

Basterra y Sánta Cruz, J. Conjunctival Tuberculosis. Plus Ultra, v. 2, p. 193. Abst., Jour. Amer. Med. Assn., v. 73, p. 947.

Blatt, N. Provocative Method for Diagnosing Eye Conditions Suspected to be Trachoma. Graefe's Arch. f. Ophth., v. 98, No. 1. Abst. Woch. f. Therap. u. Hyg. des Auges., v. 22, p. 129.

Bulley, E. C. Xerophthalmia in Rats. Biochem. Jour., v. 13, pp. 103-106.

Dubreuil, G. Vesiculo-hyaline cells and Tissues of Conjunctiva. Compt. Rend. Soc. de Biol., v. 81, p. 780.

Friedländer, F. Treatment of Trachoma. Heidelberg Diss. 1918. Abst., Centralbl. f. prakt. Augenh., May-June, 1919, p. 127.

Heed, C. R. Vernal Catarrh. (Dis.) Amer. Jour. Ophth., v. 2, pp. 609-610.

Kestenbaum, A. Primary Plastic by Partial Cauterization of Conjunctiva. Wien. med. Woch., v. 68, p. 1538.

Linder. Topography of the Embryonic Conjunctiva. (Dis.) Centralbl. f. prakt. Augenh., v. 43, May-June, 1919, p. 102.

Mayall, G. Conjunctivitis and Collyria. Jour. Amer. Vet. Assn., 1919, v. 8, p. 327.

Patterson, J. A. Tubercle of Conjunctiva. (2 ill.) Amer. Jour. Ophth., v. 2, p. 676.

Pichler, A. Koch-Weeks Conjunctivitis in War. Zeitschr. f. Augenh., v. 40, pp. 337-343.

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